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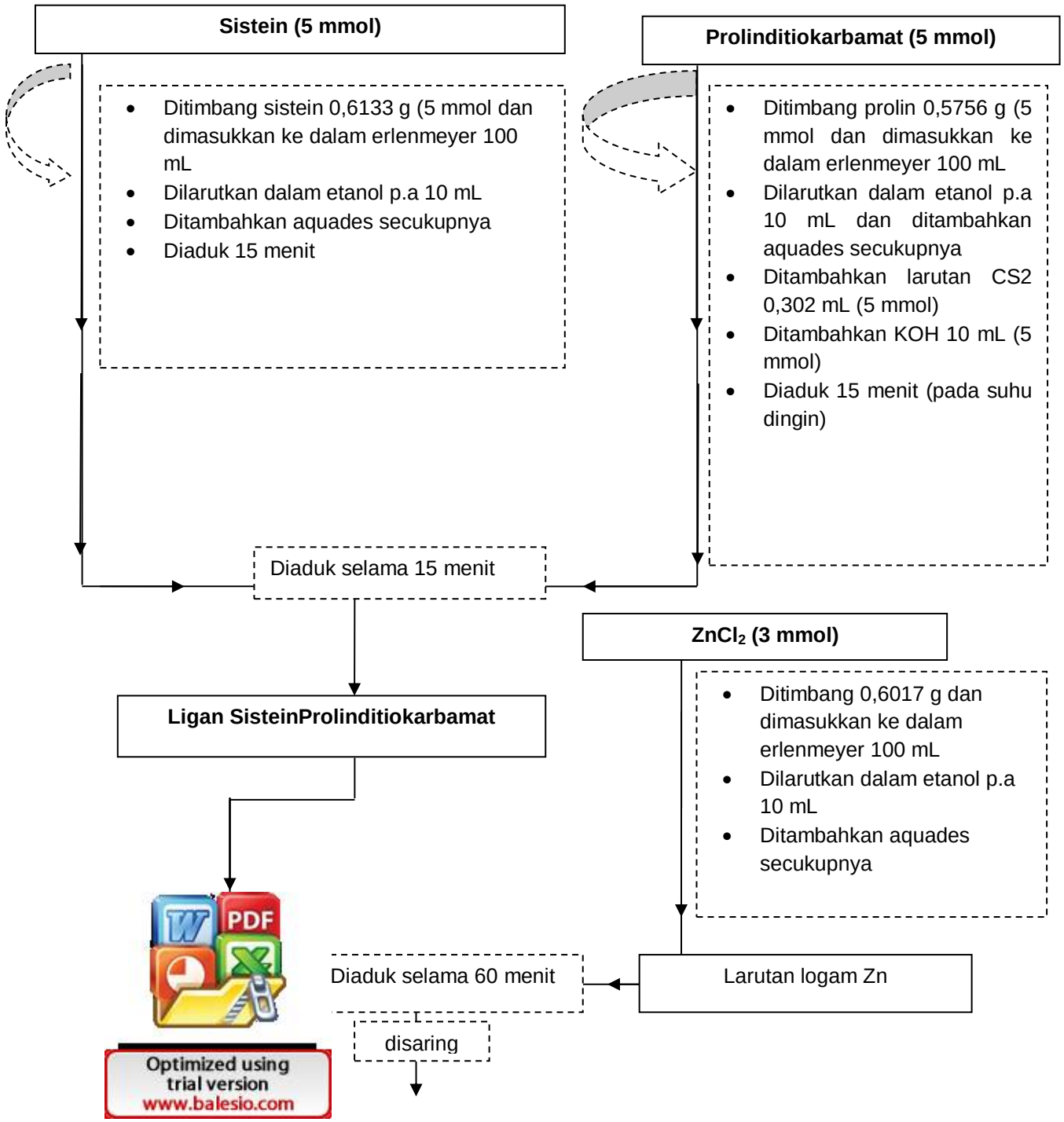
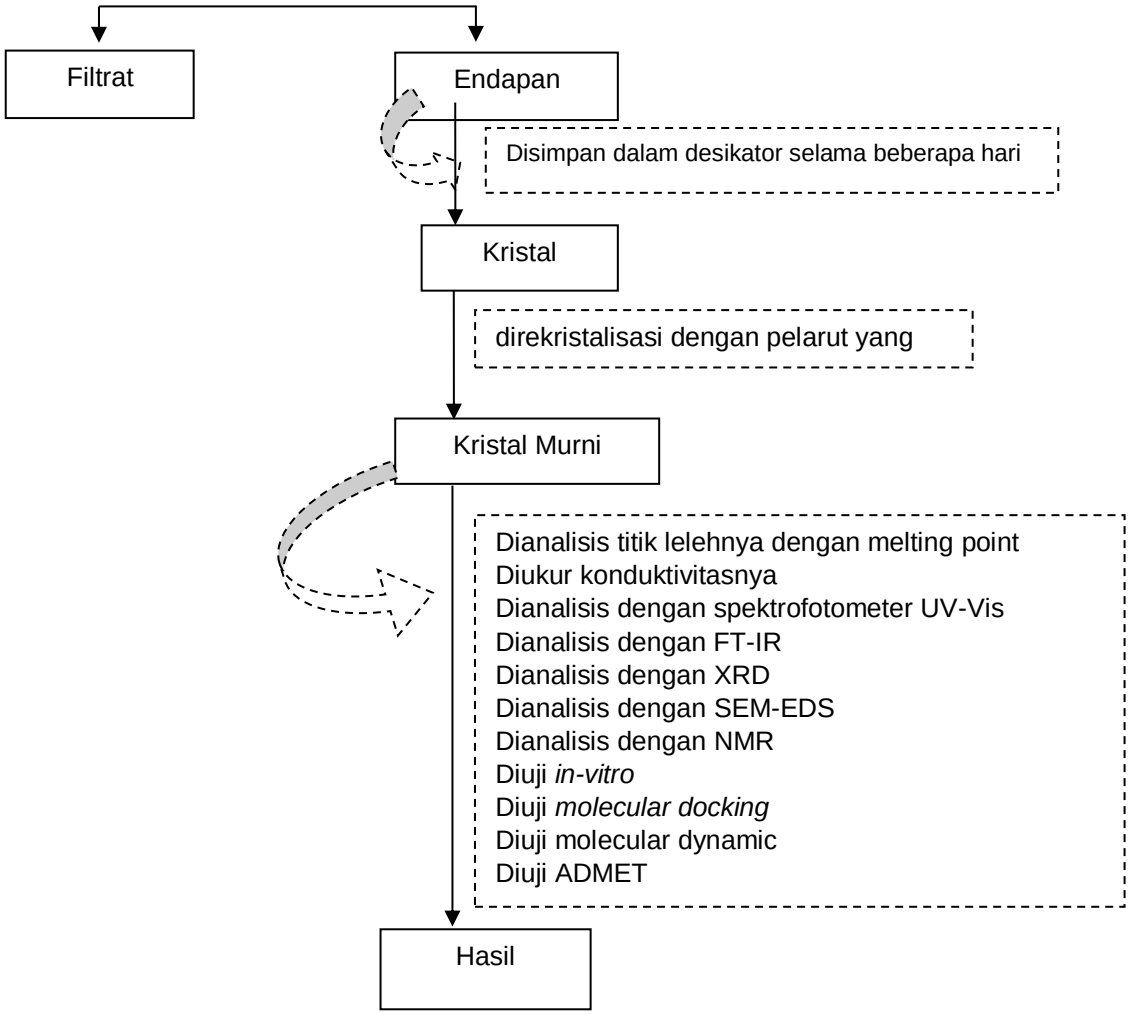
LAMPIRAN

Lampiran 1. Bagan Kerja Sintesis Senyawa Kompleks Zn(II), Cu(II), Mn(II), Ni(II), Co(II) dengan Sistein-Prolin Dithiocarbamte, Prolin-Sistein-Prolin Dithiocarbamte dan Sistein-Arginin Ditiokarbamat





Gambar 116. Bagan Kerja Sintesis Senyawa Kompleks Zn(II), Cu(II), Mn(II), Ni(II), Co(II) dengan Sistein-Prolin Dithiocarbamte, Prolin-Sistein-Prolin Dithiocarbamte dan Sistein-Arginin Ditiokarbamat

Lampiran 2. **Perhitungan Hasil Rendamen Senyawa Kompleks**

1. Kompleks Zn(II)sistein-prolinditiokarbamat

   Dik: Berat praktek = 1,0756 g

   $ZnCl_2$ + CysProDTC ⟶ Zn(II)CysProDTC
   3 mmol 5 mmol
   3 mmol 3 mmol ⟶ 3 mmol
   ---
   0 mmol 2 mmol 3 mmol

   Berat teori = mmol Zn(II)CysProDTC x Mr Zn(II)CysProDTC

   = 3 mmol x 448,74 g/mol

   = 0,003 mol x 448,74 g/mol

   = 1,3462 gr

   $$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

   $$\text{Persen Berat Rendamen} = \frac{1{,}0756}{1{,}3462} \text{x} 100\% = 79{,}89\%$$

2. Kompleks Zn(II)prolin-sistein-prolinditiokarbamat

   Dik: Berat praktek = 0,6257 g

   $ZnCl_2$ + ProCysProDTC ⟶ Zn(II)ProCysProDTC
   3 mmol 5 mmol
   3 mmol 3 mmol ⟶ 3 mmol
   ---
   0 mmol 2 mmol 3 mmol

   Berat teori = mmol Zn(II)ProCysProDTC x Mr Zn(II)ProCysProDTC

   = 3 mmol x 563,87 g/mol

   = 0,003 mol x 563,87 g/mol

$$\text{n} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}6257}{1{,}6916}\text{x}100\% = 36{,}98\%$$

3. Kompleks Zn(II)sistein-argininditiokarbamat

Dik: Berat praktek = 0,4829 g

$ZnCl_2$ + CysArgDTC ⟶ Zn(II)CysArgDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

---

0 mmol 2 mmol 3 mmol

Berat teori = mmol Zn(II)CysArgDTC x Mr Zn(II)CysArgDTC

= 3 mmol x 507,81 g/mol

= 0,003 mol x 507,81 g/mol

= 1,5234 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}}\text{x}100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}4829}{1{,}5234}\text{x}100\% = 31{,}69\%$$

4. Kompleks Cu(II)sistein-prolin ditiokarbamat

Dik: Berat praktek = 0,9984 g

$CuCl_2$ + CysProDTC ⟶ Cu(II)CysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

---

0 mmol 2 mmol 3 mmol

Berat teori = mmol Cu(II)CysProDTC x Mr Cu(II)CysProDTC

= 3 mmol x 446,89 g/mol

= 0,003 mol x 446,89 g/mol

$$\text{n} = \frac{\text{g praktek}}{\text{g teori}}\text{x}100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}9984}{1{,}3407}\text{x}100\% = 74{,}49\%$$

5. Kompleks Cu(II)prolin-sistein-prolinditiokarbamat

Dik: Berat praktek = 0,6796 g

$CuCl_2$ + ProCysProDTC ⟶ Cu(II)ProCysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

---

0 mmol 2 mmol 3 mmol

Berat teori = mmol Cu(II)ProCysProDTC x Mr Cu(II)ProCysProDTC

= 3 mmol x 562,02 g/mol

= 0,003 mol x 562,02 g/mol

= 1,6861 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}}\text{x}100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}6796}{1{,}6861}\text{x}100\% = 40{,}31\%$$

6. Kompleks Cu(II)sistein-argininditiokarbamat

Dik: Berat praktek = 0.7507 g

$CuCl_2$ + CysArgDTC ⟶ Cu(II)CysArgDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

---

0 mmol 2 mmol 3 mmol

Berat teori = mmol Cu(II)CysArgDTC x Mr Cu(II)CysArgDTC

= 3 mmol x 505,96 g/mol

= 0,003 mol x 505,96 g/mol

$$\frac{\text{g praktek}}{\text{g teori}}\text{x}100\%$$

$$\text{Persen Berat Rendamen} = \frac{0.7507}{1,5179}\text{x}100\% = 49,46\%$$

7. Kompleks Mn(II)sistein-prolin ditiokarbamat

Dik: Berat praktek = 0,2487 g

$MnCl_2$ + CysProDTC ⟶ Mn(II)CysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Mn(II)CysProDTC x Mr Mn(II)CysProDTC

= 3 mmol x 438,28 g/mol

= 0,003 mol x 438,28 g/mol

= 1,3149 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}}\text{x}100\%$$

$$\text{Persen Berat Rendamen} = \frac{0,2487}{1,3149}\text{x}100\% = 18,91\%$$

8. Kompleks Mn(II)prolin-sistein-prolinditiokarbamat

Dik: Berat praktek = 0,5051 g

$MnCl_2$ + ProCysProDTC ⟶ Mn(II)ProCysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Mn(II)ProCysProDTC x Mr Mn(II)ProCysProDTC

= 3 mmol x 553,41 g/mol

= 0,003 mol x 553,41 g/mol

= 1,6602 gr

$$\text{n} = \frac{\text{g praktek}}{\text{g teori}}\text{x}100\%$$

$$\text{ersen Berat Rendamen} = \frac{0,5051}{1,6602}\text{x}100\% = 30,42\%$$

sistein-argininditiokarbamat

Dik: Berat praktek = 0,2120 g

$MnCl_2$ + CysArgDTC ⟶ Mn(II)CysArgDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Mn(II)CysArgDTC x Mr Zn(II)CysArgDTC

= 3 mmol x 497,35 g/mol

= 0,003 mol x 497,35 g/mol

= 1,4921 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}2120}{1{,}4921} \text{x} 100\% = 14{,}21\%$$

10. Kompleks Ni(II)sistein-prolin ditiokarbamat

Dik: Berat praktek = 0,2614 g

$NiCl_2$ + CysProDTC ⟶ Ni(II)CysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Ni(II)CysProDTC x Mr Ni(II)CysProDTC

= 3 mmol x 442,04 g/mol

= 0,003 mol x 442,04 g/mol

= 1,3261 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

damen = $\frac{0{,}2614}{1{,}3261} \text{x} 100\% = 19{,}71\%$

olin-sistein-prolinditiokarbamat

k = 0,4335 g

$NiCl_2$ + ProCysProDTC ⟶ Ni(II)ProCysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Ni(II)ProCysProDTC x Mr Ni(II)ProCysProDTC

= 3 mmol x 557,17 g/mol

= 0,003 mol x 557,17 g/mol

= 1,6715 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}4335}{1{,}6715} \text{x} 100\% = 25{,}93\%$$

12. Kompleks Ni(II)sistein-argininditiokarbamat

Dik: Berat praktek = 0,2865 g

$NiCl_2$ + CysArgDTC ⟶ Ni(II)CysArgDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Ni(II)CysArgDTC x Mr Ni(II)CysArgDTC

= 3 mmol x 501,11 g/mol

= 0,003 mol x 501,11 g/mol

= 1,5033 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{damen} = \frac{0{,}2865}{1{,}5033} \text{x} 100\% = 19{,}06\%$$

istein-prolin ditiokarbamat

x = 0,2094 g

TC ⟶ Co(II)CysProDTC

3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Co(II)CysProDTC x Mr Co(II)CysProDTC

= 3 mmol x 442,28 g/mol

= 0,003 mol x 442,28 g/mol

= 1,3268 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}2094}{1{,}3268} \text{x} 100\% = 15{,}78\%$$

14. Kompleks Co(II)prolin-sistein-prolinditiokarbamat

Dik: Berat praktek = 0,3998 g

$CoCl_2$ + ProCysProDTC ⟶ Co(II)ProCysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

0 mmol 2 mmol 3 mmol

Berat teori = mmol Co(II)ProCysProDTC x Mr Co(II)ProCysProDTC

= 3 mmol x 557,17 g/mol

= 0,003 mol x 557,17 g/mol

= 1,6715 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}3998}{1{,}6715} \text{x} 100\% = 23{,}92\%$$

istein-argininditiokarbamat

k = 0,1739 g

TC ⟶ Co(II)CysArgDTC
mol

3 mmol 3 mmol ⟶ 3 mmol

---

0 mmol 2 mmol 3 mmol

Berat teori = mmol Co(II)CysArgDTC x Mr Zn(II)CysArgDTC

= 3 mmol x 501,11 g/mol

= 0,003 mol x 501,11 g/mol

= 1,5033 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}1739}{1{,}5033} \text{x} 100\% = 11{,}57\%$$

16. Kompleks sistein-prolin ditiokarbamat

Dik: Berat praktek = 0,4412 g

Sistein + ProDTC ⟶ CysProDTC
3 mmol 5 mmol
3 mmol 3 mmol ⟶ 3 mmol

---

0 mmol 2 mmol 3 mmol

Berat teori = mmol CysProDTC x Mr CysProDTC

= 3 mmol x 428,01 g/mol

= 0,003 mol x 428,01 g/mol

= 1,2840 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}4412}{1{,}2840} \text{x} 100\% = 34{,}36\%$$

sistein-prolinditiokarbamat

k = 0,4209 g

TC ⟶ ProCysProDTC
mol
mol ⟶ 3 mmol

---

0 mmol 2 mmol 3 mmol

Berat teori = mmol ProCysProDTC x Mr ProCysProDTC

= 3 mmol x 312,44 g/mol

= 0,003 mol x 312,44 g/mol

= 0,9373 gr

$$\text{Persen Rendamen} = \frac{\text{g praktek}}{\text{g teori}} \text{x} 100\%$$

$$\text{Persen Berat Rendamen} = \frac{0{,}4209}{0{,}7624} \text{x} 100\% = 55{,}21\%$$

Lampiran 3. Hasil Uji Sitotoksisitas Senyawa Kompleks dan Logam terhadap sel kanker MCF-7

Tabel 18. Absorbansi Hasil Zn(II)CysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					3,91	7,81	15,63	31,25	62,50	125,00	250,00	500,00
Absorbansi 570nm	0,5018	0,7830	0,6180	0,7924	0,7746	0,7991	0,7952	0,7897	0,8025	0,7923	0,6272	0,6302
	0,4966	0,7785	0,6159	0,7800	0,7988	0,8089	0,8056	0,8032	0,7891	0,7793	0,6224	0,6245
Absorbansi 600nm	0,6289	0,1959	0,4470	0,2247	0,1970	0,2093	0,2142	0,2099	0,2184	0,2314	0,4801	0,4892
	0,6224	0,1952	0,4442	0,2258	0,2050	0,2110	0,2119	0,2205	0,2138	0,232	0,4800	0,5001
Selisih Absorbansi	-0,1271	0,5871	0,1710	0,5677	0,5776	0,5898	0,5810	0,5798	0,5841	0,5609	0,1471	0,1410
	-0,1258	0,5833	0,1717	0,5542	0,5938	0,5979	0,5937	0,5827	0,5753	0,5473	0,1424	0,1244
% Sel hidup		103,80	43,27	100,98	102,42	104,20	102,92	102,74	103,37	99,99	39,79	38,91
		103,25	43,37	99,02	104,78	105,38	104,76	103,16	102,09	98,01	39,11	36,49
Rata-rata % sel hidup		103,53	43,32	100,00	103,60	104,79	103,84	102,95	102,73	99,00	39,45	37,70
SEM		0,28	0,05	0,98	1,18	0	0,	0,2	0,6	0,99	0,34	1,21
Normalisasi data % Sel hidup		103,53	43,32	100,00	103,60	104,79	103,84	102,95	102,73	99,00	39,45	37,70

Tabel 19. Absorbansi Hasil Zn(II)ProCysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,3808	0,7966	0,6552	0,7947	0,7953	0,7935	0,8035	0,7824	0,7984	0,8134	0,8480	0,9361
	0,3873	0,8017	0,6617	0,8003	0,7994	0,7980	0,8078	0,7855	0,7909	0,8106	0,8563	0,8943
Absorbansi 600nm	0,4811	0,1986	0,4338	0,1937	0,1941	0,1938	0,1952	0,1926	0,1954	0,2191	0,2643	0,3664
	0,4890	0,1954	0,4250	0,1946	0,1978	0,1955	0,1954	0,1931	0,1977	0,2135	0,2635	0,3282
Selisih Absorbansi	-0,1003	0,5980	0,2214	0,6010	0,6012	0,5997	0,6083	0,5898	0,6030	0,5943	0,5837	0,5697
	-0,1017	0,6063	0,2367	0,6057	0,6016	0,6025	0,6124	0,5924	0,5932	0,5971	0,5928	0,5661
% Sel hidup		99,41	45,85	99,84	99,86	99,65	100,87	98,24	100,12	98,8	97	95,39
		100,59	48,03	100,50	99,92	100,05	101,46	98,61	98,73	99,2	98	94,87
Rata-rata % sel hidup		100,00	46,94	100,17	99,89	99,85	101,17	98,43	99,42	99,0	98	95,13
SEM		0,59	1,09	0,33	0,03	0	0,29	0,1	0,70	0,2	0	0,26
Normalisasi data % Sel hidup		100,11	46,99	100,28	100,00	99,96	101,27	98,53	99,53	99,19	98,1	95,23

Tabel 20. Absorbansi Hasil Zn(II)CysArgDTC terhadap Sel MCF-7

	Media	Media	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					3,91	7,81	15,63	31,25	62,50	125,00	250,00	500,00
Absorbar 570nm				0,7668	0,7933	0,7831	0,7830	0,7960	0,7954	0,8039	0,6602	0,7041
				0,7810	0,7894	0,7962	0,8001	0,8134	0,7937	0,8117	0,6775	0,6924
Absorbar 600nm				0,2157	0,2016	0,2020	0,2087	0,2202	0,2138	0,2168	0,4565	0,5553
				0,2135	0,2089	0,2069	0,2073	0,2127	0,2107	0,2183	0,4401	0,5645

Selisih Absorbansi	-0,1238	0,5782	0,1770	0,5511	0,5917	0,5811	0,5743	0,5758	0,5816	0,5871	0,2037	0,1488
	-0,1261	0,5850	0,2101	0,5675	0,5805	0,5893	0,5928	0,6007	0,5830	0,5934	0,2374	0,1279
% Sel hidup		102,76	44,13	98,80	104,74	103,19	102,19	102,41	103,26	104,06	48,03	40,01
		103,76	48,97	101,20	103,10	104,38	104,90	106,05	103,46	104,98	52,96	36,95
Rata-rata % sel hidup		103,26	46,55	100,00	103,92	103,79	103,54	104,23	103,36	104,52	50,49	38,48
SEM		0,50	2,42	1,20	0,82	0	1,35	1,	0,1	0,4	2,46	1,53
Normalisasi data % Sel hidup		103,26	46,55	100,00	103,92	103,79	103,54	104,23	103,36	104,52	50,49	38,48

Tabel 21. Absorbansi Hasil CuII)CysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					3,91	7,81	15,63	31,25	62,50	125,00	250,00	500,00
Absorbansi 570nm	0,4973	0,7809	0,6316	0,7560	0,7528	0,7469	0,7318	0,7228	0,6494	0,5069	0,4987	0,7272
	0,4882	0,7630	0,6282	0,7659	0,7510	0,7452	0,7398	0,7247	0,6473	0,4998	0,4928	0,7477
Absorbansi 600nm	0,6293	0,2031	0,4363	0,2497	0,2508	0,2520	0,2390	0,2791	0,4051	0,5829	0,6024	0,8031
	0,6191	0,1944	0,4422	0,2294	0,2439	0,2345	0,2559	0,2798	0,4050	0,5876	0,6009	0,8233
Selisih Absorbansi	-0,1320	0,5778	0,1953	0,5063	0,5020	0,4949	0,4928	0,4437	0,2443	-0,0760	-0,1037	-0,0759
	-0,1309	0,5686	0,1860	0,5365	0,5071	0,5107	0,4839	0,4449	0,2423	-0,0878	-0,1081	-0,0756
% Sel hidup		108,64	50,05	97,69	97,03	95,94	95,62	88,10	57,56	8,49	4,25	8,51
		107,23	48,63	102,31	97,81	98,36	94,26	88,28	57,25	6,69	3,58	8,55
Rata-rata % sel hidup		107,93	49,34	100,00	97,42	97,15	94,94	88,19	57,40	7,59	3,91	8,53
SEM		0,70	0,71	2,3	0,39	1,	0,	0,0	0,15	0,90	0,34	0,02
Normalisasi data % Sel hidup		107,93	49,34	100,00	97,42	97,15	94,94	88,19	57,40	7,59	3,91	8,53

Tabel 22. Absorbansi Hasil Cu(II)ProCysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					0,78	1,56	3,13	6,25	12,50	25,00	50,00	100,00
Absorbansi 570nm	0,3793	0,8033	0,6478	0,7992	0,8099	0,8024	0,8019	0,8023	0,8023	0,8087	0,8045	0,7648
	0,3871	0,8049	0,6550	0,8155	0,8226	0,8116	0,8080	0,8046	0,8009	0,8034	0,8065	0,7717
Absorbansi 600nm	0,4809	0,1963	0,4315	0,1972	0,1987	0,2005	0,1975	0,2003	0,2054	0,1979	0,2249	0,5405
	0,4874	0,1939	0,4398	0,1965	0,1977	0,1965	0,1968	0,2062	0,2060	0,1937	0,2017	0,5445
Selisih Absorbansi	-0,1016	0,6070	0,2163	0,6020	0,6112	0,6019	0,6044	0,6020	0,5969	0,6108	0,5796	0,2243
	-0,1003	0,6110	0,2152	0,6190	0,6249	0,6151	0,6112	0,5984	0,5949	0,6097	0,6048	0,2272
% Sel hidı				99,01	100,31	99,00	99,35	99,01	98,30	100,25	95,86	45,81
				101,41	102,24	100,86	100,31	98,51	98,01	100,10	99,41	46,22
Rata-rata sel hidu				100,21	101,27	99,93	99,83	98,76	98,15	100,18	97,63	46,02
SEM				1,20	0,96	0,93	0,48	0,25	0,14	0,08	1,77	0,20

Normalisasi data % Sel hidup		99,79	44,51	100,00	101,06	99,72	99,62	98,55	97,95	99,96	97,43	45,92

Tabel 23. Absorbansi Hasil Cu(II)CysArgDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					3,91	7,81	15,63	31,25	62,50	125,00	250,00	500,00
Absorbansi 570nm	0,4930	0,7745	0,6199	0,7865	0,7894	0,8025	0,7903	0,7805	0,7595	0,7012	0,5793	0,5094
	0,5037	0,7756	0,6135	0,7788	0,7757	0,7884	0,7799	0,7619	0,7632	0,6654	0,5950	0,5110
Absorbansi 600nm	0,6182	0,1964	0,4454	0,2272	0,2093	0,2146	0,2310	0,2402	0,2663	0,3815	0,5415	0,6255
	0,6306	0,1963	0,4442	0,2215	0,2050	0,2146	0,2302	0,2353	0,2747	0,4250	0,5337	0,6272
Selisih Absorbansi	-0,1252	0,5781	0,1745	0,5593	0,5801	0,5879	0,5593	0,5403	0,4932	0,3197	0,0378	-0,1161
	-0,1269	0,5793	0,1693	0,5573	0,5707	0,5738	0,5497	0,5266	0,4885	0,2404	0,0613	-0,1162
% Sel hidup		102,89	43,92	100,15	103,19	104,33	100,15	97,37	90,49	65,13	23,94	1,45
		103,07	43,16	99,85	101,81	102,26	98,74	95,37	89,80	53,55	27,38	1,44
Rata-rata % sel hidup		102,98	43,54	100,00	102,50	103,30	99,44	96,37	90,14	59,34	25,66	1,45
SEM		0,09	0,38	0,15	0,69	1,03	0,70	1,00	0,34	5,79	1,72	0,01
Normalisasi data % Sel hidup		102,98	43,54	100,00	102,50	103,30	99,44	96,37	90,14	59,34	25,66	1,45

Tabel 24. Absorbansi Hasil Mn(II)CysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,3876	0,7217	0,5268	0,7296	0,7423	0,7356	0,7465	0,7312	0,7273	0,7299	0,7347	0,6979
	0,4532	0,7285	0,5264	0,7291	0,7499	0,7384	0,7348	0,7539	0,7439	0,7411	0,7234	0,7006
Absorbansi 600nm	0,4835	0,2164	0,4970	0,2229	0,2291	0,2230	0,2289	0,2253	0,2241	0,2344	0,2842	0,2959
	0,5659	0,2099	0,5071	0,2341	0,2263	0,2240	0,2231	0,2357	0,2297	0,2391	0,2487	0,2852
Selisih Absorbansi	-0,0959	0,5053	0,0298	0,5067	0,5132	0,5126	0,5176	0,5059	0,5032	0,4955	0,4505	0,4020
	-0,1127	0,5186	0,0193	0,4950	0,5236	0,5144	0,5117	0,5182	0,5142	0,5020	0,4747	0,4154
% Sel hidup		100,74	22,16	100,97	102,04	101,94	102,77	100,83	100,39	99,1	91,68	83,67
		102,93	20,42	99,03	103,76	102,24	101,79	102,87	102,21	100,19	95,68	85,88
Rata-rata % sel hidup		101,83	21,29	100,00	102,90	102,09	102,28	101,85	101,30	99,65	93,68	84,77
SEM		1,10	0,87	0,	0,86	0,	0,	1	0,	0,5	2,00	1,11
Normalisasi data % Sel hidup		101,83	21,29	100,00	102,90	102,09	102,28	101,85	101,30	99,65	93,68	84,77

Tabel [redacted] (II)ProCysProDTC terhadap Sel MCF-7

	Pelarut	Konsentrasi Sampel (µg/mL)							
		7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorb 570n	0,7920	0,7496	0,7750	0,7892	0,7767	0,8049	0,7579	0,8190	0,9788
	0,8207	0,7457	0,7769	0,7894	0,7735	0,8106	0,7505	0,8232	0,9640

Absorbansi 600nm	0,4849	0,1897	0,4296	0,1904	0,1814	0,1880	0,1794	0,1771	0,1781	0,1846	0,1913	0,4318
	0,5030	0,1997	0,4267	0,2018	0,2065	0,2065	0,2031	0,2098	0,2020	0,1957	0,2180	0,4222
Selisih Absorbansi	-0,1013	0,6008	0,2138	0,6016	0,5682	0,5870	0,6098	0,5996	0,6268	0,5733	0,6277	0,5470
	-0,0992	0,6124	0,2347	0,6189	0,5392	0,5704	0,5863	0,5637	0,6086	0,5548	0,6052	0,5418
% Sel hidup		99,18	44,43	99,29	94,57	97,23	100,45	99,01	102,86	95,2	102,99	91,57
		100,82	47,39	101,74	90,46	94,88	97,13	93,93	100,28	92,6	99,80	90,83
Rata-rata % sel hidup		100,00	45,91	100,52	92,52	96,05	98,79	96,47	101,57	93,9	101,39	91,20
SEM		0,82	1,4	1,2	2,05	1,	1,	2	1,2	1,3	1,59	0,37
Normalisasi data % Sel hidup		108,09	49,62	108,65	100,00	103,82	106,78	104,27	109,79	101,58	109,60	98,58

Tabel 26. Absorbansi Hasil Mn(II)CysArgDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,4439	0,7397	0,5287	0,7350	0,6080	0,6109	0,6092	0,6234	0,6435	0,6744	0,6312	0,6201
	0,4589	0,7308	0,5206	0,7430	0,6371	0,6095	0,6111	0,5997	0,6468	0,6269	0,6461	0,6858
Absorbansi 600nm	0,5536	0,2166	0,5005	0,2248	0,4049	0,3965	0,3949	0,4190	0,3958	0,4351	0,5427	0,6292
	0,5728	0,2190	0,5064	0,2484	0,3995	0,3925	0,4025	0,4128	0,4020	0,4281	0,5686	0,6758
Selisih Absorbansi	-0,1097	0,5231	0,0282	0,5102	0,2031	0,2144	0,2143	0,2044	0,2477	0,2393	0,0885	-0,0091
	-0,1139	0,5118	0,0142	0,4946	0,2376	0,2170	0,2086	0,1869	0,2448	0,1988	0,0775	0,0100
% Sel hidup		103,37	22,79	101,27	51,27	53,11	53,09	51,48	58,5	57,1	32,61	16,72
		101,53	20,51	98,73	56,89	53,53	52,17	48,63	58,0	50,5	30,82	19,83
Rata-rata % sel hidup		102,45	21,65	100,00	54,08	53,32	52,63	50,06	58,3	53,8	31,72	18,28
SEM		0,92	1,14	1,2	2,81	0,2	0,	1,4	0,2	3,3	0,90	1,55
Normalisasi data % Sel hidup		102,45	21,65	100,00	54,08	53,32	52,63	50,06	58,30	53,87	31,72	18,28

Tabel 27. Absorbansi Hasil Ni(II)CysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,4706	0,7814	0,5248	0,7689	0,7613	0,7500	0,7688	0,7576	0,7620	0,7749	0,7789	0,7705
	0,4804	0,7713	0,5186	0,7687	0,7541	0,7588	0,7661	0,7926	0,7803	0,7766	0,7888	0,7635
Absorbansi 600nm	0,5808	0,2432	0,5375	0,2686	0,2347	0,2291	0,2430	0,2409	0,2342	0,2373	0,2529	0,3316
	0,6017	0,2302	0,5398	0,2606	0,2330	0,2287	0,2327	0,2419	0,2412	0,2376	0,2546	0,3391
Selisih Absorbansi	-0,1102	0,5382	-0,0127	0,5003	0,5266	0,5209	0,5258	0,5167	0,5278	0,5376	0,5260	0,4389
	-0,1213	0,5411	-0,0212	0,5081	0,5211	0,5301	0,5334	0,5507	0,5391	0,5390	0,5342	0,4244
% Sel hidup		105,48	16,62	99,37	103,61	102,69	103,48	102,02	103,81	105,39	103,52	89,47
		105,95	15,25	100,63	102,73	104,18	104,71	107,50	105,63	105,61	104,84	87,13
Rata-rata % sel hidup		105,72	15,94	100,00	103,17	103,44	104,10	104,76	104,72	105,50	104,18	88,30
SEM		0,23	0,6	0,6	0,44	0,74	0,	2	0,91	0,11	0,66	1,17
Normalisasi data % Sel hidup		105,72	15,94	100,00	103,17	103,44	104,10	104,76	104,72	105,50	104,18	88,30

Tabel 28. Absorbansi Hasil Ni(II)ProCysProDTC terhadap Sel MCF-7

	Pelarut	Konsentrasi Sampel (µg/mL)							
		7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorb	0,7632	0,7779	0,7773	0,7954	0,7687	0,7752	0,7638	0,6875	0,6821
570n	0,7622	0,7656	0,7764	0,7811	0,7632	0,7664	0,7603	0,6823	0,6596
Absorb	0,2595	0,2404	0,2508	0,2525	0,2298	0,2496	0,2657	0,3168	0,3913
600n	0,2660	0,2290	0,2394	0,2473	0,2309	0,2391	0,2774	0,3324	0,3779
Selisi	0,5037	0,5375	0,5265	0,5429	0,5389	0,5256	0,4981	0,3707	0,2908
Absorb	0,4962	0,5366	0,5370	0,5338	0,5323	0,5273	0,4829	0,3499	0,2817
	100,61	106,10	104,31	106,98	106,33	104,17	99,70	79,00	66,03

		106,83	14,66	99,39	105,95	106,02	105,50	105,26	104,44	97,23	75,63	64,55
Rata-rata % sel hidup		106,65	16,06	100,00	106,03	105,17	106,24	105,79	104,30	98,46	77,31	65,29
SEM		0,18	1,4	0,6	0,07	0,8	0,	0,5	0,14	1,23	1,69	0,74
Normalisasi data % Sel hidup		106,65	16,06	100,00	106,03	105,17	106,24	105,79	104,30	98,46	77,31	65,29

Tabel 29. Absorbansi Hasil Ni(II)CysArgDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,464	0,769	0,528	0,763	0,765	0,767	0,761	0,759	0,76	0,73	0,50	0,521
	0,474	0,764	0,525	0,749	0,778	0,767	0,771	0,772	0,76	0,72	0,55	0,524
Absorbansi 600nm	0,583	0,228	0,542	0,250	0,241	0,230	0,231	0,226	0,24	0,21	0,56	0,597
	0,594	0,222	0,535	0,245	0,245	0,237	0,237	0,243	0,23	0,24	0,54	0,585
Selisih Absorbansi	-0,1189	0,5410	-0,0141	0,5126	0,5235	0,5367	0,5301	0,5329	0,5173	0,5264	-0,0634	-0,0764
	-0,1192	0,5422	-0,0101	0,5041	0,5325	0,5300	0,5340	0,5292	0,5316	0,4744	0,0123	-0,0608
% Sel hidup		105,20	16,73	100,68	102,41	104,52	103,47	103,91	101,43	102,88	8,8	6,80
		105,40	17,37	99,32	103,85	103,45	104,09	103,32	103,71	94,5	20,9	9,28
Rata-rata % sel hidup		105,30	17,05	100,00	103,13	103,98	103,78	103,62	102,57	98,7	14,9	8,04
SEM		0,10	0,3	0,6	0,72	0,53	0,	0,2	1,1	4,1	6,0	1,24
Normalisasi data % Sel hidup		105,30	17,05	100,00	103,13	103,98	103,78	103,62	102,57	98,7 3	14,9 0	8,04

Tabel 30. Absorbansi Hasil Co(II)CysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,4322	0,7220	0,3988	0,7301	0,7404	0,7307	0,7294	0,7323	0,7167	0,7269	0,6750	0,4985
	0,4400	0,7259	0,5604	0,7338	0,7249	0,7240	0,7279	0,7256	0,7276	0,7425	0,6932	0,5102
Absorbansi 600nm	0,5427	0,2170	0,3491	0,2339	0,2200	0,2580	0,2244	0,2384	0,2274	0,2224	0,2899	0,4759
	0,5509	0,2109	0,5182	0,2413	0,2165	0,2219	0,2710	0,2357	0,2357	0,2350	0,3065	0,4804
Selisih Absorbansi	-0,1105	0,5050	0,0497	0,4962	0,5204	0,4727	0,5050	0,4939	0,4893	0,5045	0,3851	0,0226
	-0,1109	0,5150	0,0422	0,4925	0,5084	0,5021	0,4569	0,4899	0,4919	0,5075	0,3867	0,0298
% Sel hidup		101,76	26,51	100,31	104,31	96,42	101,76	99,93	99,17	101,68	81,94	22,03
		103,41	25,27	99,69	102,32	101,28	93,81	99,26	99,60	102,17	82,21	23,22
Rata-rata % sel hidup		102,59	25,89	100,00	103,31	98,85	97,79	99,60	99,38	101,93	82,08	22,63
SEM		0,83	0,6	0,3	0,99	2,43	3,	0,3	0,21	0,25	0,13	0,59
Normalisasi data % Sel hidup		102,59	25,89	100,00	103,31	98,85	97,79	99,60	99,38	101,93	82,08	22,63

Tabel 31. Absorbansi Hasil Co(II)ProCysProDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,5384	0,8836	0,6517	0,8558	0,8727	0,8534	0,8862	0,8851	0,8540	0,7953	0,5998	0,6646
	0,5046	0,8839	0,6643	0,8409	0,8903	0,8991	0,8947	0,8906	0,8912	0,8418	0,6034	0,5949
Absorbansi 600nm	0,6779	0,2705	0,5100	0,2832	0,2556	0,2475	0,2608	0,2637	0,3038	0,3961	0,5263	0,6220
	0,6326	0,2874	0,5192	0,2983	0,2636	0,2696	0,2768	0,2960	0,3110	0,3890	0,5156	0,5713
Selisih Absorb	-0,1395	0,6131	0,1417	0,5726	0,6171	0,6059	0,6254	0,6214	0,5502	0,3992	0,0735	0,0426
				0,5426	0,6267	0,6295	0,6179	0,5946	0,5802	0,4528	0,0878	0,0236
% Sel hi				102,17	108,61	106,99	109,81	109,23	98,	77,09	29,98	25,51
				97,83	109,99	110,40	108,72	105,35	103,27	84,84	32,05	22,76
Rata-ra sel hid				100,00	109,30	108,69	109,26	107,29	101,10	80,96	31,01	24,13
SEM				2,1	0,69	1,	0,	1,9	2,	3,88	1,03	1,37
Normali data % Sel hi				100,00	109,30	108,69	109,26	107,29	101,10	80,96	31,01	24,13

Tabel 32. Absorbansi Hasil Co(II)CysArgDTC terhadap Sel MCF-7

	Media	Media + Sel	Cisplatin	Pelarut	Konsentrasi Sampel							
					7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00
Absorbansi 570nm	0,4377	0,6754	0,5417	0,6987	0,6740	0,6733	0,6778	0,6638	0,6686	0,6793	0,6988	0,5341
	0,4529	0,6906	0,5324	0,6979	0,6940	0,7026	0,6977	0,6790	0,6709	0,6954	0,7005	0,5170
Absorbansi 600nm	0,5636	0,1924	0,4796	0,2008	0,1893	0,1955	0,1968	0,1882	0,1912	0,1904	0,2194	0,4556
	0,5804	0,1936	0,4715	0,1989	0,1962	0,1987	0,1995	0,1944	0,1925	0,1910	0,2329	0,4783
Selisih Absorbansi	-0,1259	0,4830	0,0621	0,4979	0,4847	0,4778	0,4810	0,4756	0,4774	0,4889	0,4794	0,0785
	-0,1275	0,4970	0,0609	0,4990	0,4978	0,5039	0,4982	0,4846	0,4784	0,5044	0,4676	0,0387
% Sel hidup		98,86	30,61	101,28	99,14	98,02	98,54	97,66	97,9	99,	98,2	33,27
		101,14	30,42	101,46	101,26	102,25	101,33	99,12	98,1	102,34	96,3	26,82
Rata-rata % sel hidup		100,00	30,52	101,37	100,20	100,14	99,94	98,39	98,0	101,08	97,3	30,05
SEM		1,14	0,10	0,09	1,06	2,1	1,	0,7	0,0	1,	0,9	3,23
Normalisasi data % Sel hidup		98,65	30,10	100,00	98,85	98,78	98,58	97,06	96,71	99, 71	96,01	29,64

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				3	7,81	15,63	31,25	62,50	125,00	250,00	500,00

Gambar 117. Dokumentasi Well Plate Hasil Zn(II)CysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				7,8	15,63	31,25	62,50	125,00	250,00	500,00	1000,

Gambar 118. Dokumentasi Well Plate Hasil Zn(II)ProCysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				3	7,81	15,63	31,25	62,50	125,00	250,00	500,00

G si Well Plate Hasil Zn(II)CysArgDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				3	7,81	15,63	31,25	62,50	125,00	250,00	500,00

Gambar 120. Dokumentasi Well Plate Hasil CuII)CysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				0,7	1,56	3,13	6,25	12,50	25,00	50,00	100,00

Gambar 121. Dokumentasi Well Plate Hasil Cu(II)ProCysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi Sampel							
				3	7,81	15,63	31,25	62,50	125,00	250,00	500,00

Gambar 122. Dokumentasi Well Plate Hasil Cu(II)CysArgDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi Sampel							
				7	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

Gambar 123. Dokumentasi Well Plate Hasil Mn(II)CysProDTC terhadap Sel MCF-7

Media	Media	Cisplatin	Pelarut	Konsentrasi Sampel							
				7,	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

Ga Well Plate Hasil Mn(II)ProCysProDTC terhadap Sel MCF-7

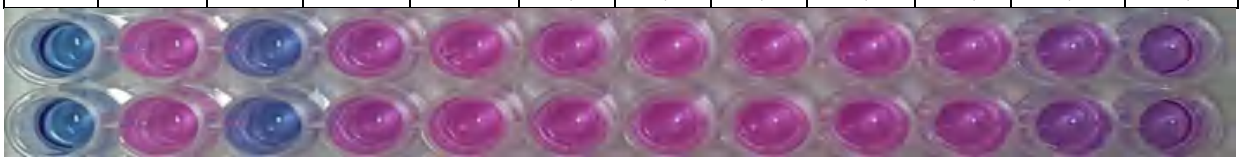
Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi Sampel (µg/mL)							
				7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

Gambar 125. Dokumentasi Well Plate Hasil Mn(II)CysArgDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				7,81	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

Gambar 126. Dokumentasi Well Plate Hasil Ni(II)CysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi Sampel							
				7	15,63	31,25	62,50	125,00	250,00	500,00	1000,00



Gambar 127. Dokumentasi Well Plate Hasil Ni(II)ProCysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				7	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

Gambar 128. Dokumentasi Well Plate Hasil Ni(II)CysArgDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				7	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

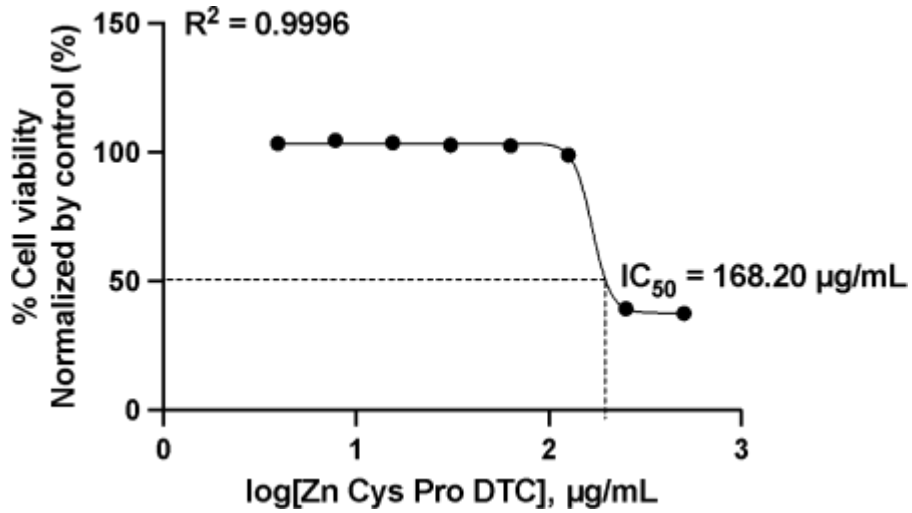
Ga Well Plate Hasil Co(II)CysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				7	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

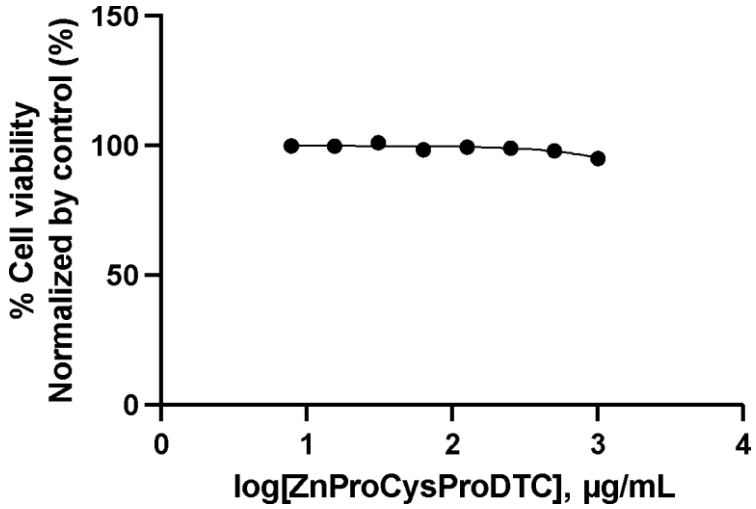
Gambar 130. Dokumentasi Well Plate Hasil Co(II)ProCysProDTC terhadap Sel MCF-7

Media	Media +Sel	Cisplatin	Pelarut	Konsentrasi							
				7,8	15,63	31,25	62,50	125,00	250,00	500,00	1000,00

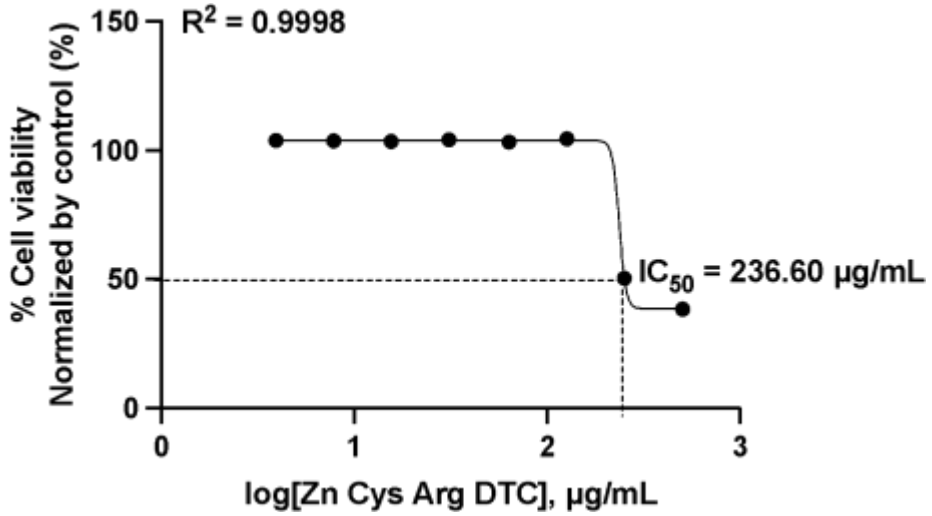
Gambar 131. Dokumentasi Well Plate Hasil Co(II)CysArgDTC terhadap Sel MCF-7



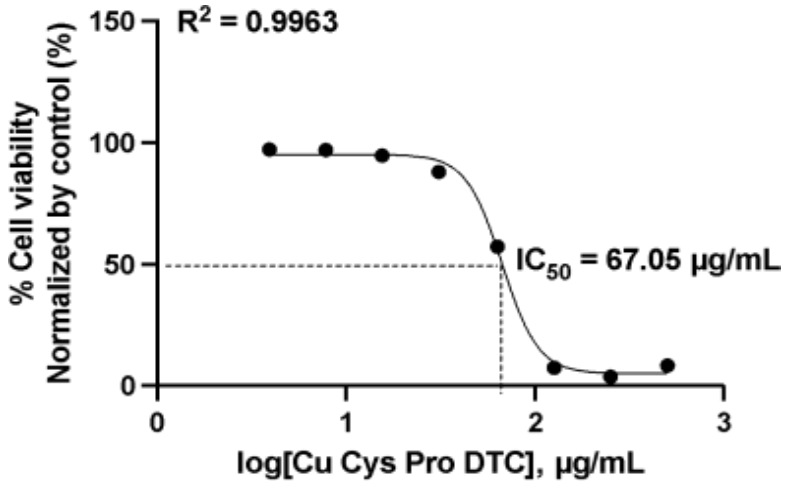
Gambar 132. Kurva Hasil Uji Zn(II)ProCysDTC terhadap Sel MCF-7



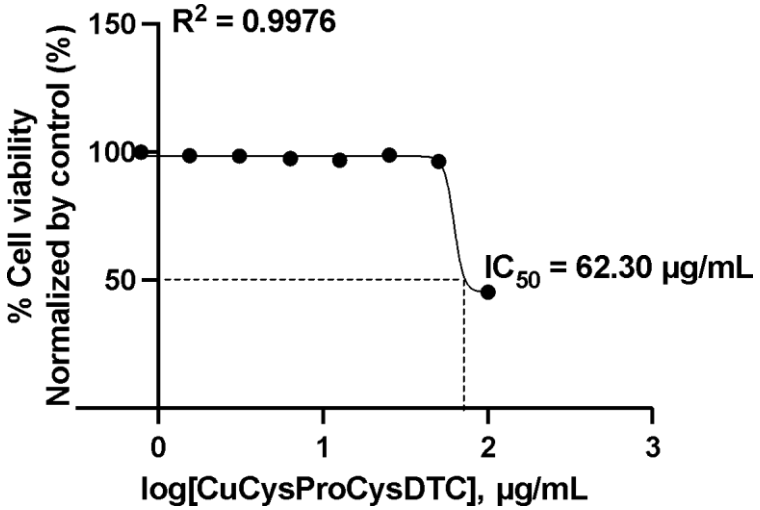
Gambar 133. Kurva Hasil Uji Zn(II)ProCysProDTC terhadap Sel MCF-7



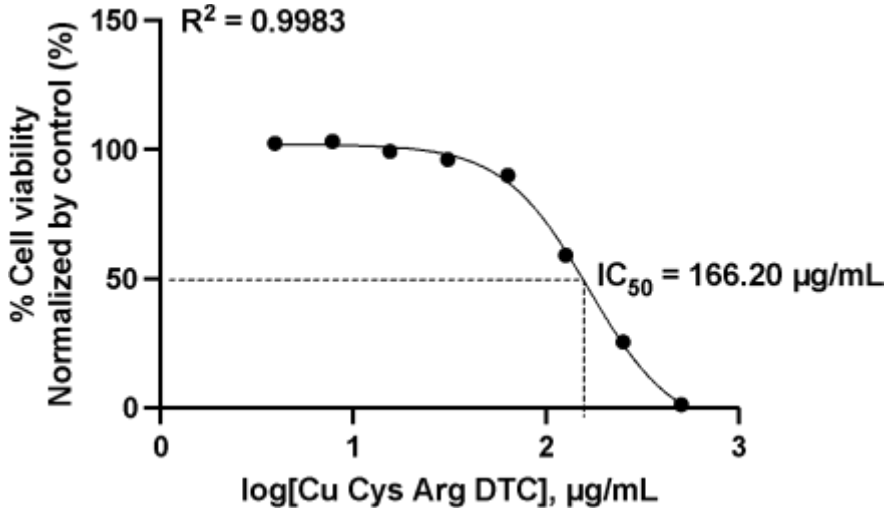
Gambar 134. Kurva Hasil Uji Zn(II)CysArgDTC terhadap Sel MCF-7



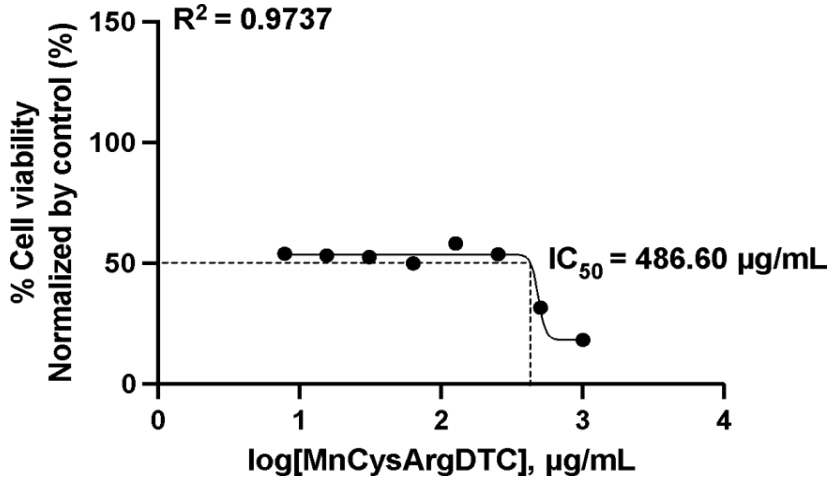
Gambar 135. Kurva Hasil Uji Cu(II)ProCysDTC terhadap Sel MCF-7



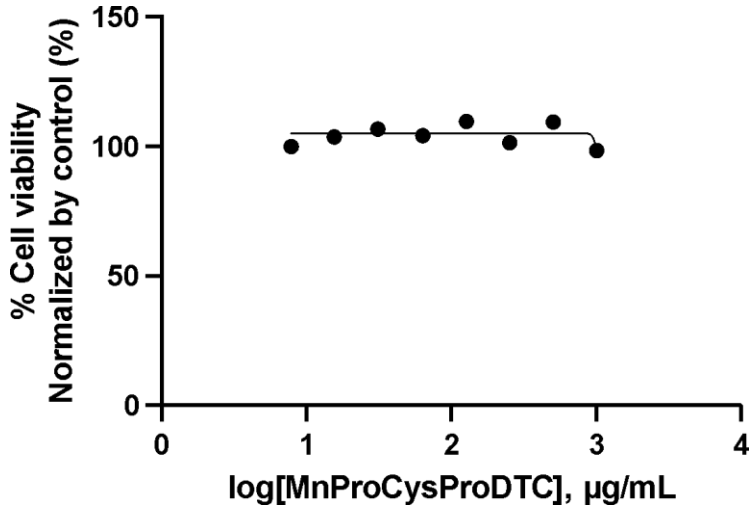
Gambar 136. Kurva Hasil Uji Cu(II)ProCysProDTC terhadap Sel MCF-7



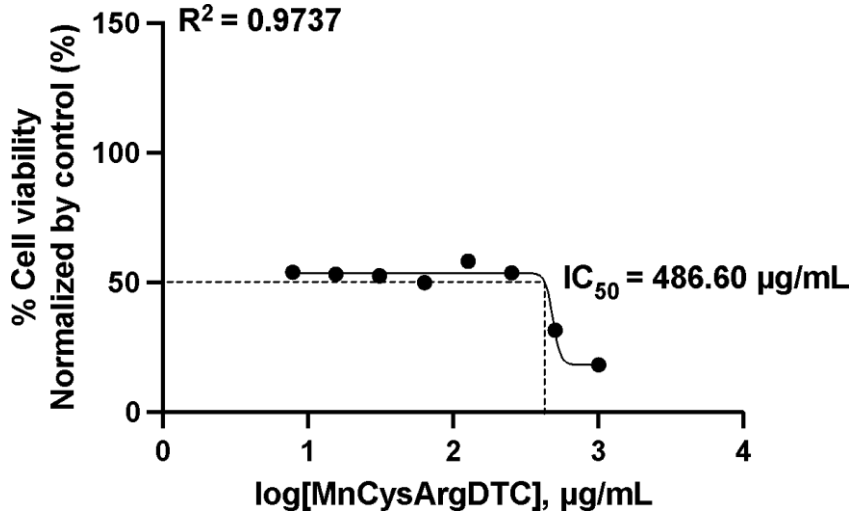
Gambar 137. Kurva Hasil Uji Cu(II)CysArgDTC terhadap Sel MCF-7



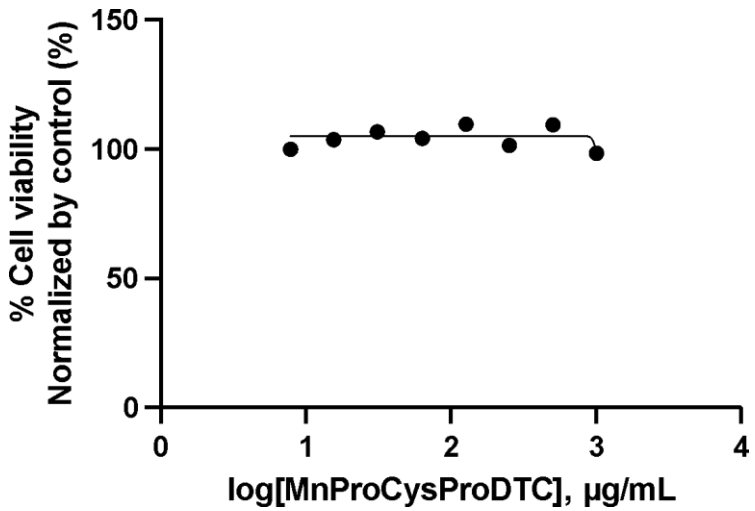
Gambar 138. Kurva Hasil Uji Mn(II)ProCysDTC terhadap Sel MCF-7



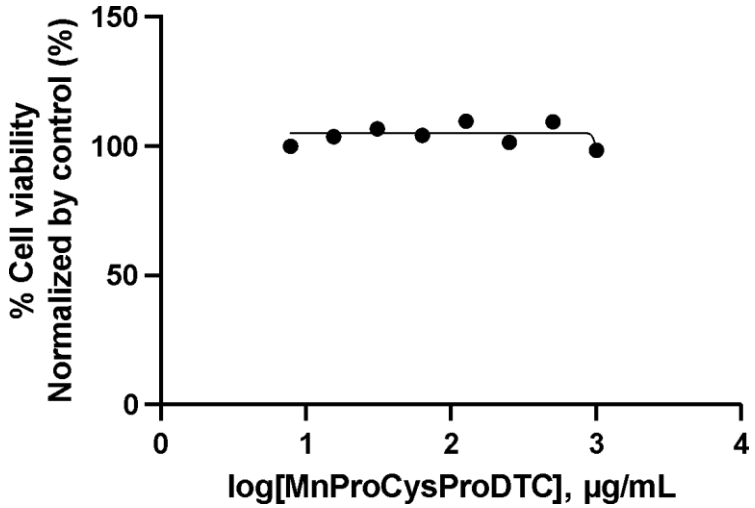
Gambar 139. Kurva Hasil Uji Mn(II)ProCysProDTC terhadap Sel MCF-7



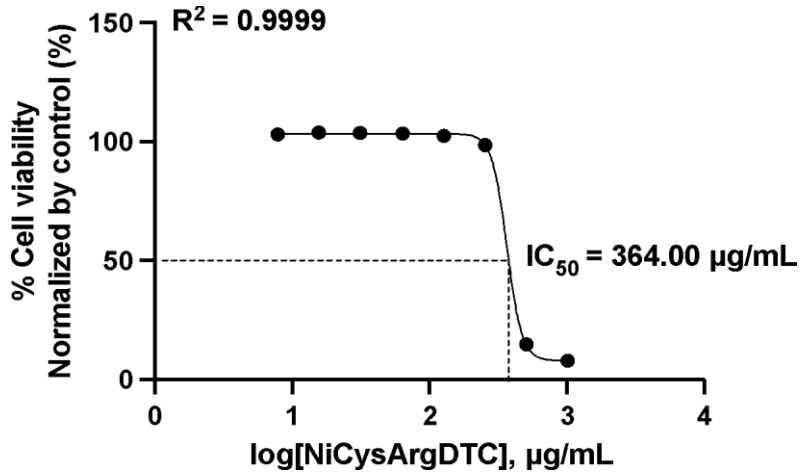
Gambar 140. Kurva Hasil Uji Mn(II)CysArgDTC terhadap Sel MCF-7



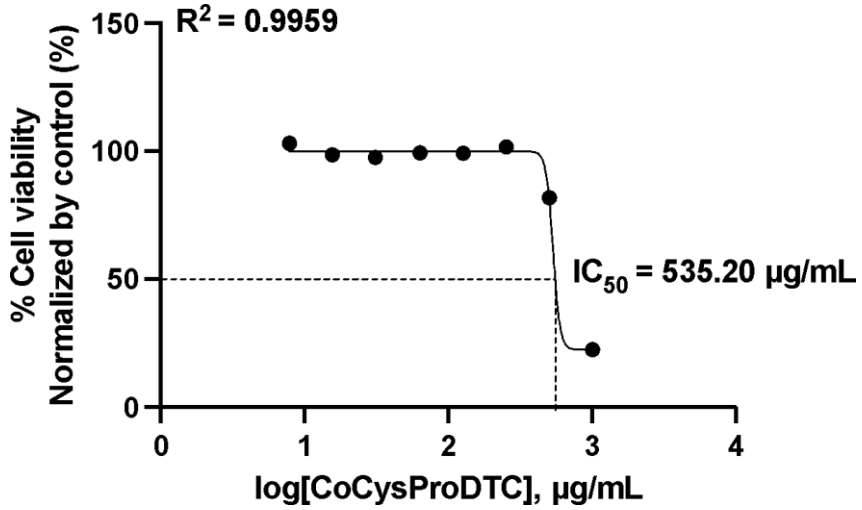
Gambar 141. Kurva Hasil Uji Ni(II)ProCysDTC terhadap Sel MCF-7



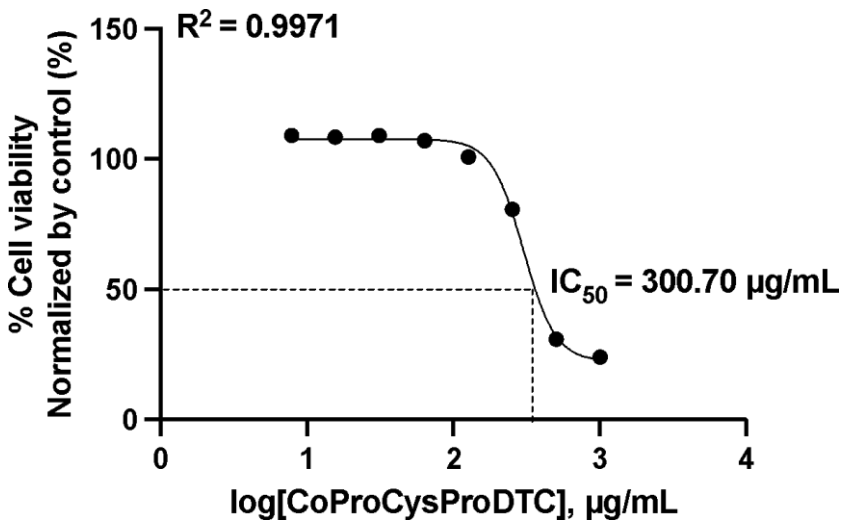
Gambar 142. Kurva Hasil Uji Ni(II)ProCysProDTC terhadap Sel MCF-7



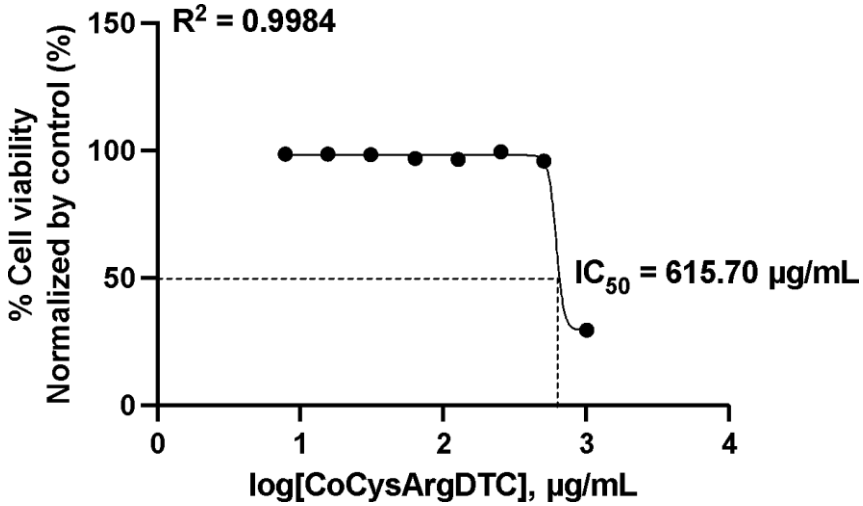
Gambar 143. Kurva Hasil Uji Ni(II)CysArgDTC terhadap Sel MCF-7



Gambar 144. Kurva Hasil Uji Co(II)ProCysDTC terhadap Sel MCF-7

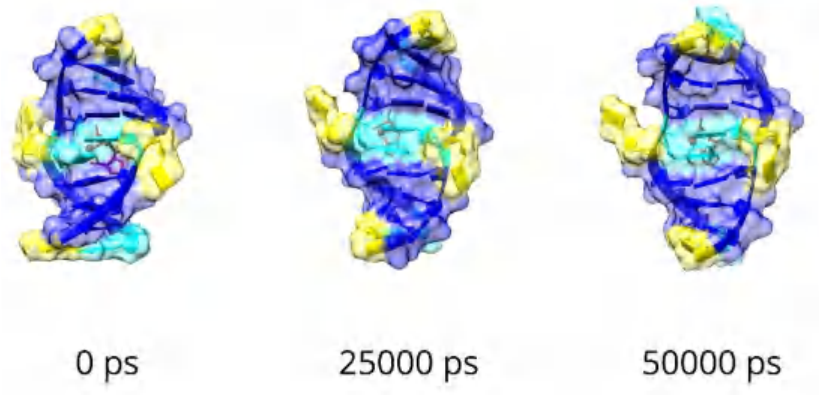


Gambar 145. Kurva Hasil Uji Co(II)ProCysProDTC terhadap Sel MCF-7

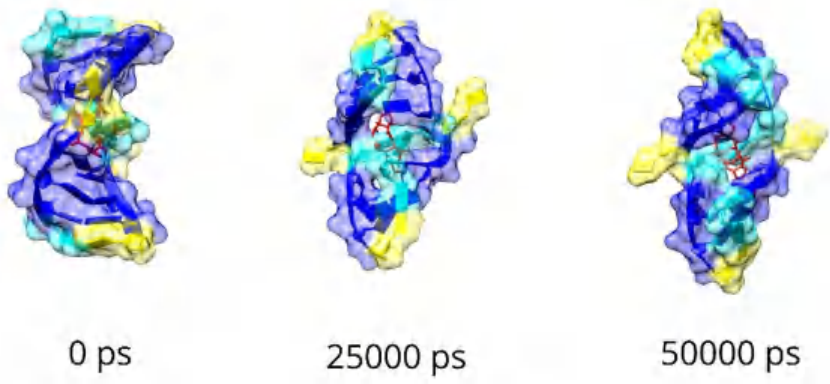


Gambar 146. Kurva Hasil Uji Co(II)CysArgDTC terhadap Sel MCF-7

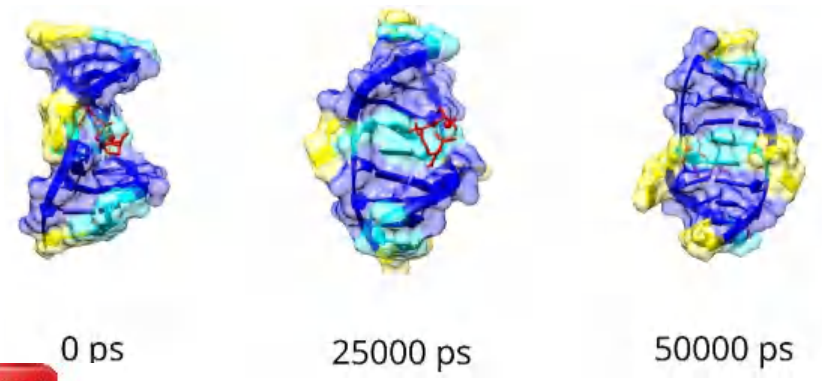
Lampiran 4. Struktur senyawa kompleks setelah simulasi MD selama 50 ns



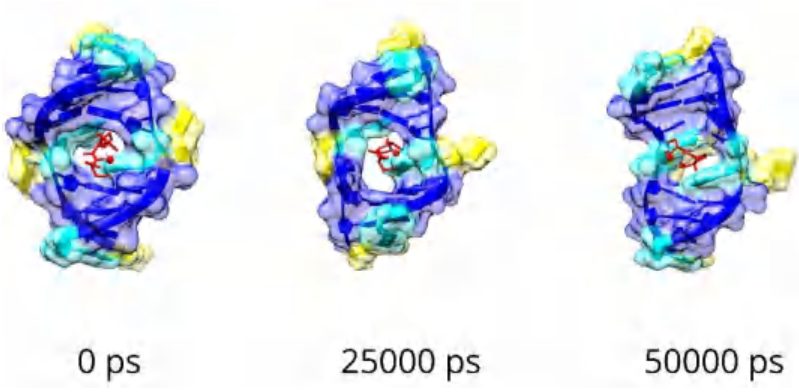
Gambar 147. Struktur ZnProCysDTC-DNA setelah simulasi MD selama 50 ns



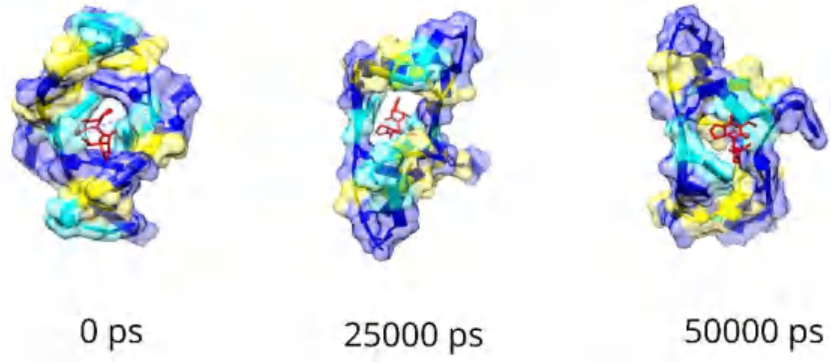
Gambar 148. Struktur ZnProCysProDTC-DNA setelah simulasi MD selama 50 ns



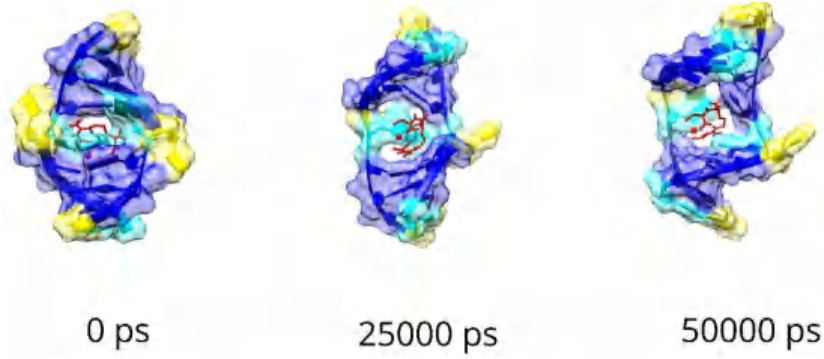
ıktur ZnCysArgDTC-DNA setelah simulasi MD selama 50 ns



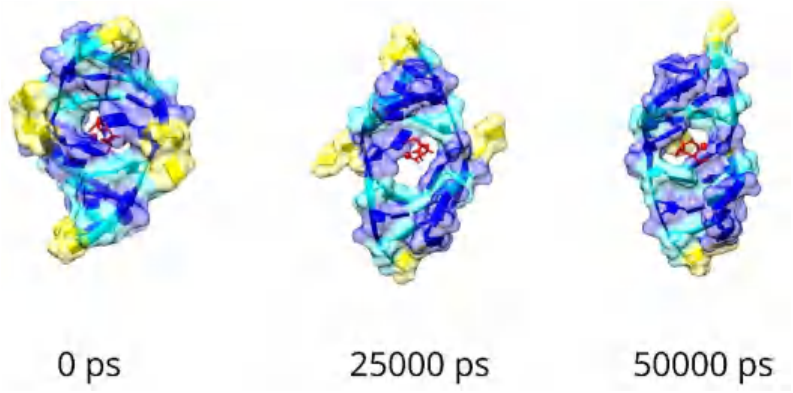
Gambar 150. Struktur CuProCysDTC-DNA setelah simulasi MD selama 50 ns



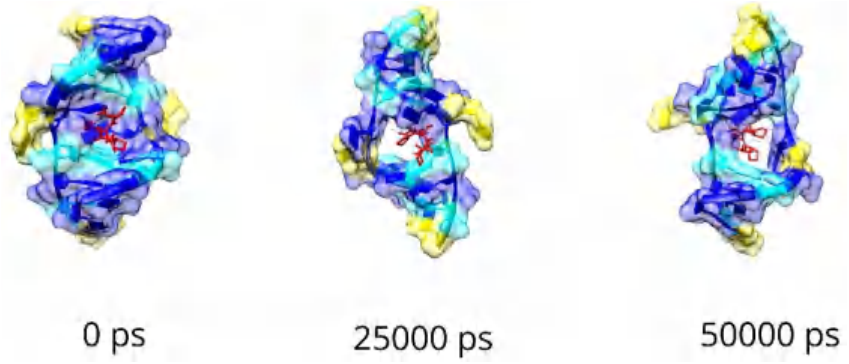
Gambar 151. Struktur CuProCysProDTC-DNA setelah simulasi MD selama 50 ns



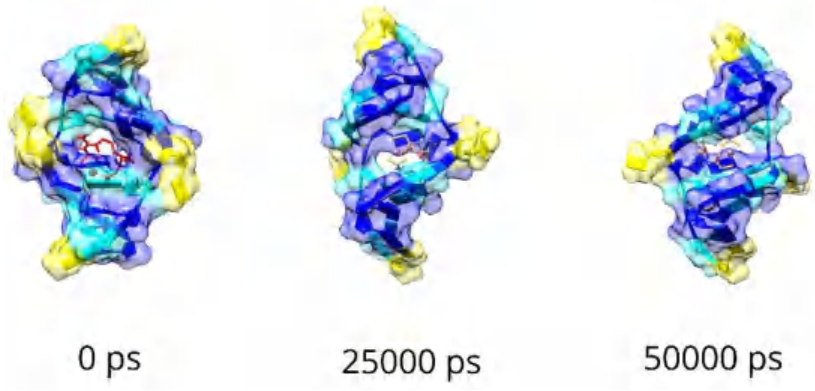
Gambar 152. Struktur CuCysArgDTC-DNA setelah simulasi MD selama 50 ns



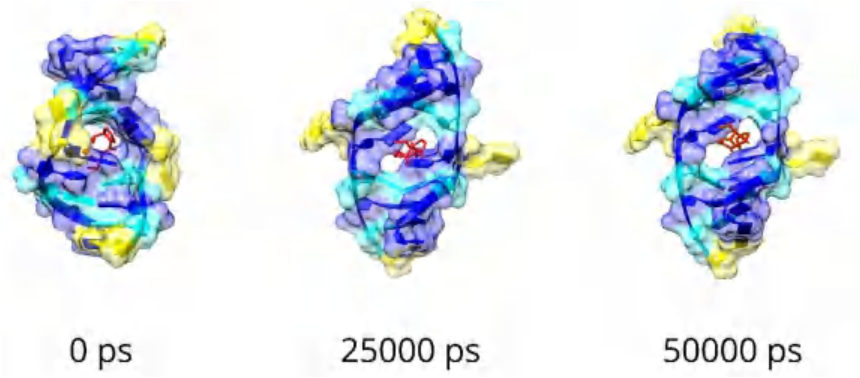
Gambar 153. Struktur MnProCysDTC-DNA setelah simulasi MD selama 50 ns



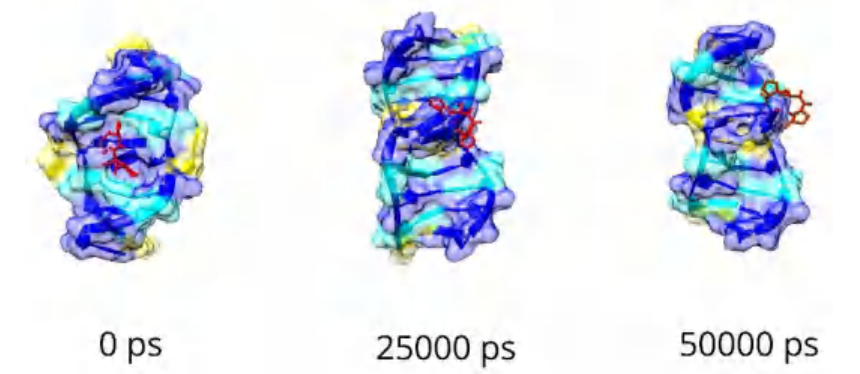
Gambar 154. Struktur MnProCysProDTC-DNA setelah simulasi MD selama 50 ns



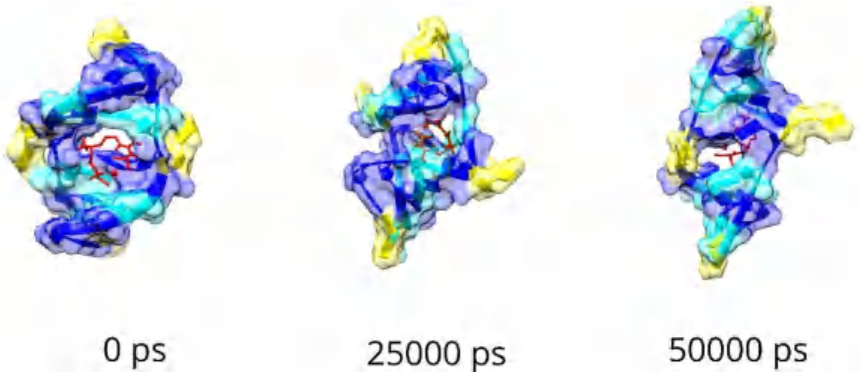
Gambar 155. Struktur MnCysArgDTC-DNA setelah simulasi MD selama 50 ns



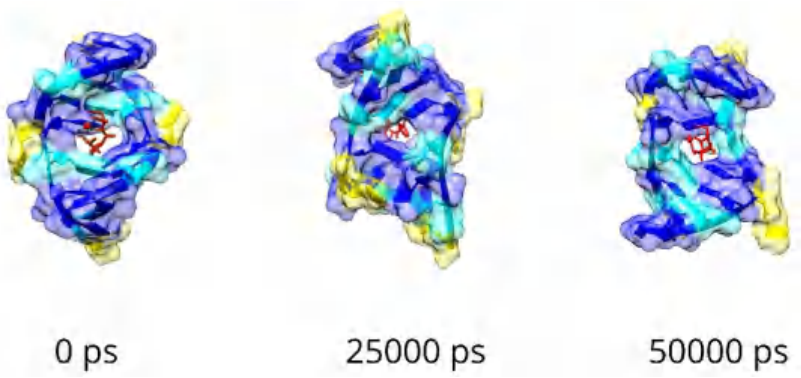
Gambar 156. Struktur NiProCysDTC-DNA setelah simulasi MD selama 50 ns



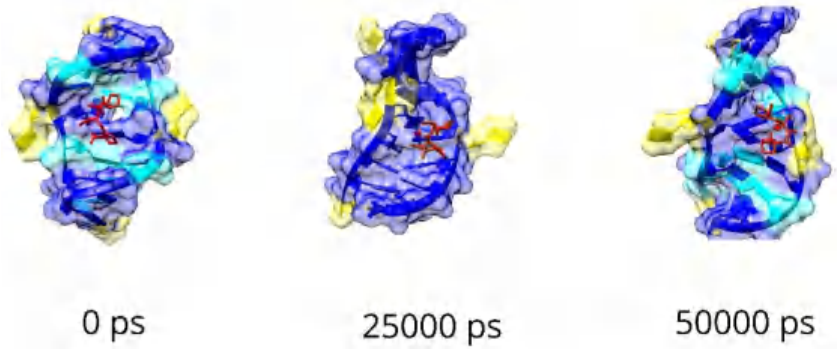
Gambar 157. Struktur NiProCysProDTC-DNA setelah simulasi MD selama 50 ns



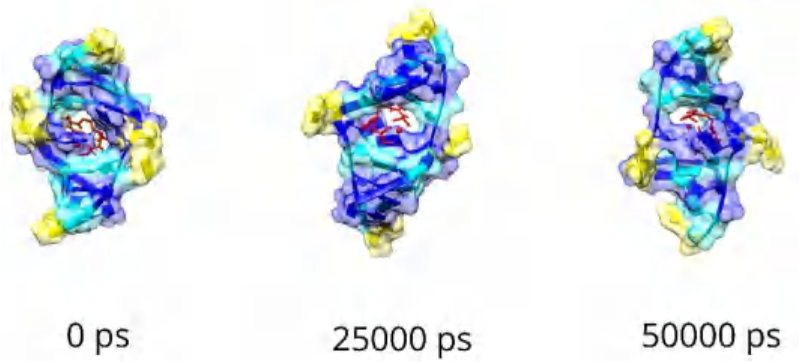
Gambar 158. Struktur NiCysArgDTC-DNA setelah simulasi MD selama 50 ns



Gambar 159. Struktur CoProCysDTC-DNA setelah simulasi MD selama 50 ns

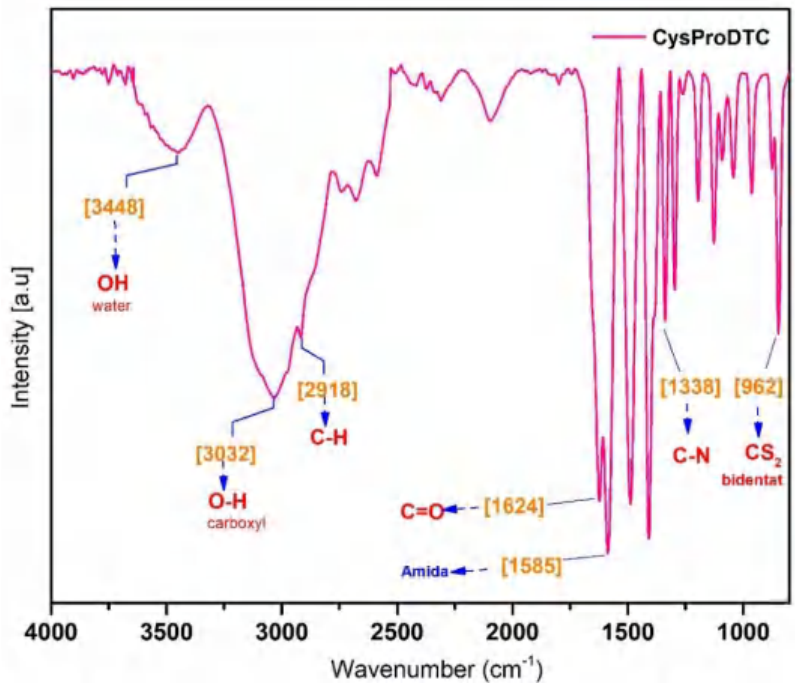


Gambar 160. Struktur CoProCysProDTC-DNA setelah simulasi MD selama 50 ns

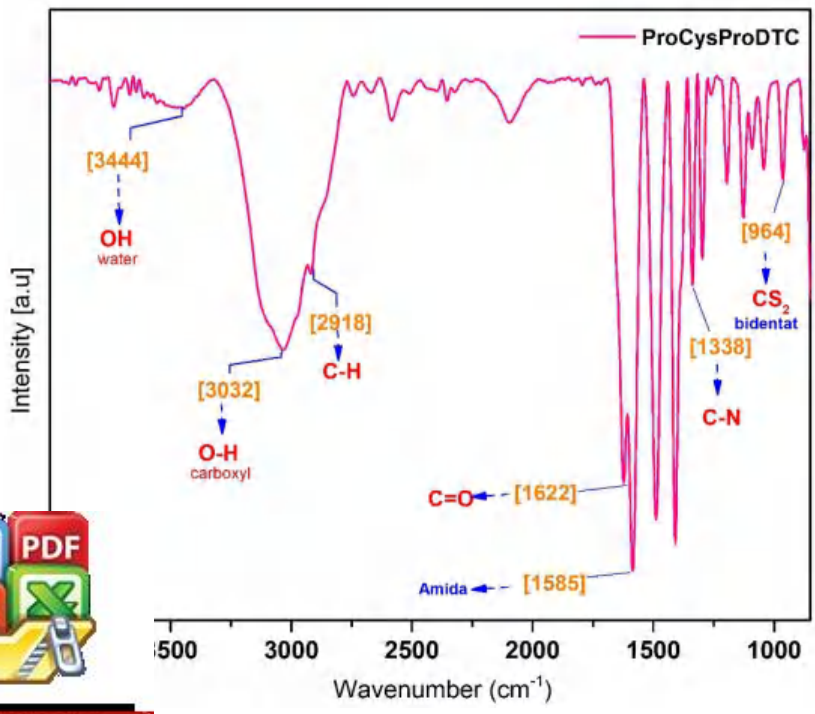


Gambar 161. Struktur CoCysArgDTC-DNA setelah simulasi MD selama 50 ns

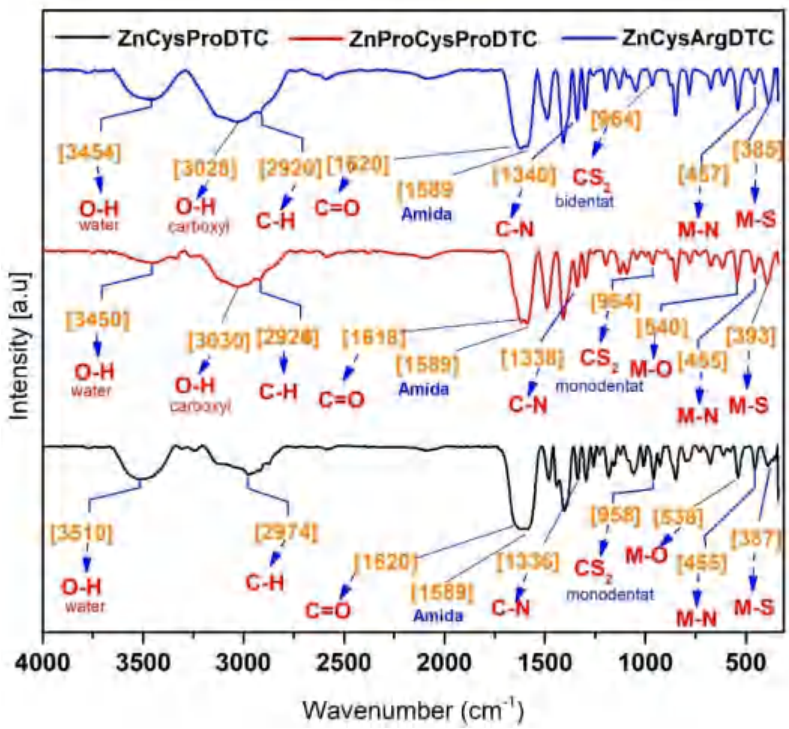
Lampiran 5. Hasil spektrum IR senyawa kompleks



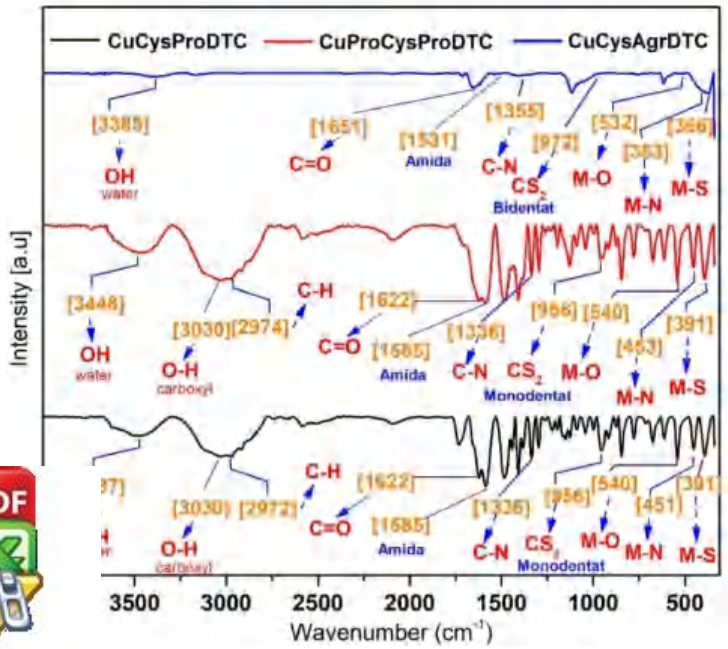
Gambar 162. Spektrum IR dari ligan sistein-prolin-ditiokarbamat



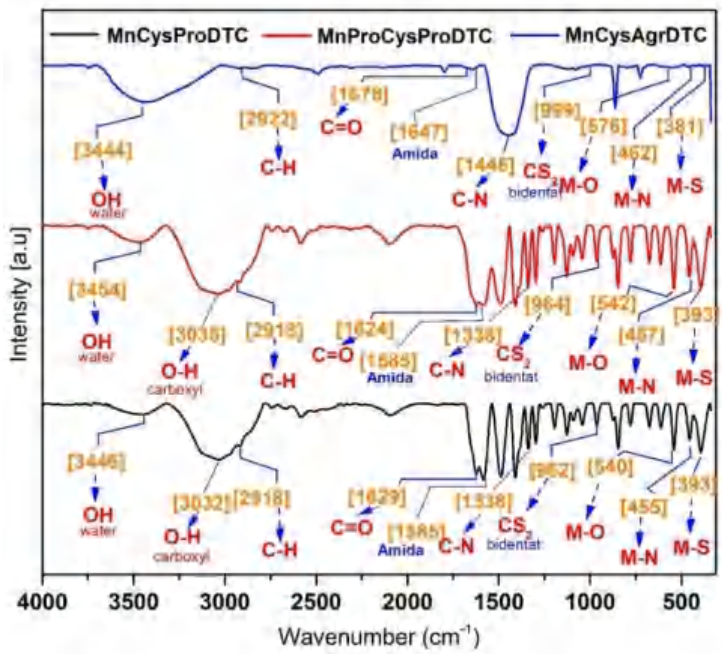
m IR dari ligan prolin-sistein-prolin-ditiokarbamat



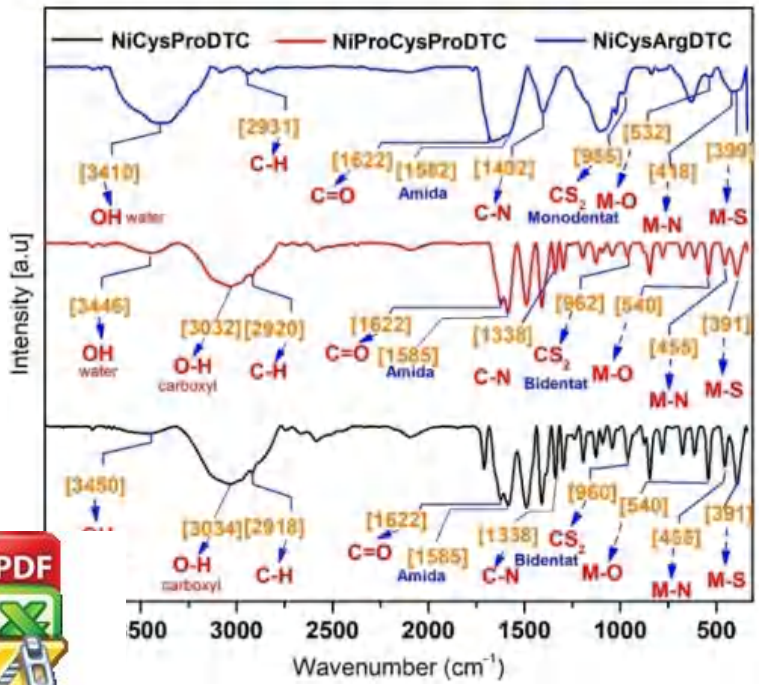
Gambar 164. Spektrum IR dari kompleks ZnCysProDTC, ZnProCysProDTC, dan ZnCysArgDTC



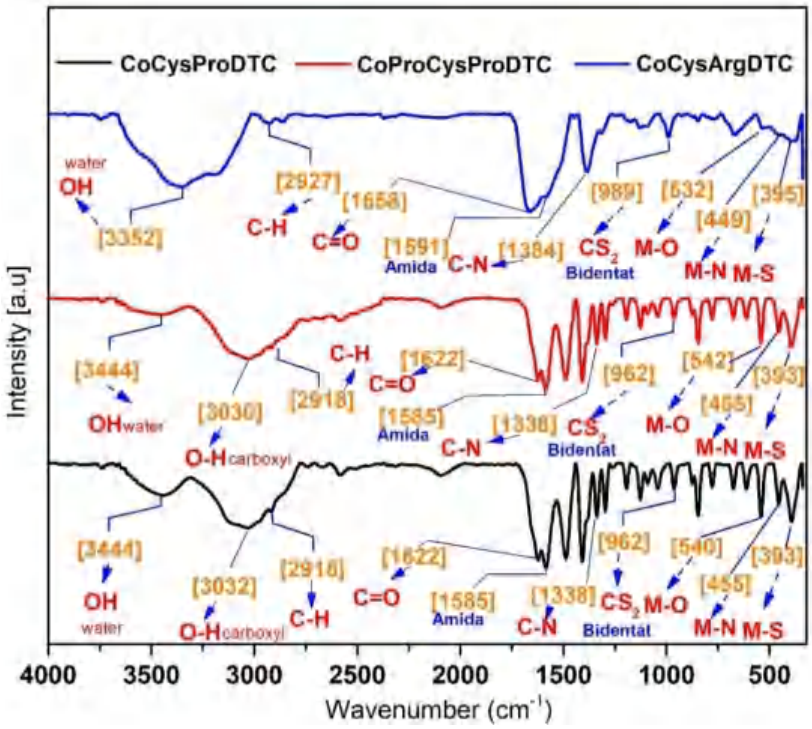
rum IR dari kompleks CuCysProDTC, CuProCysProDTC, dan sArgDTC



Gambar 166. Spektrum IR dari kompleks MnCysProDTC, MnProCysProDTC, dan MnCysArgDTC

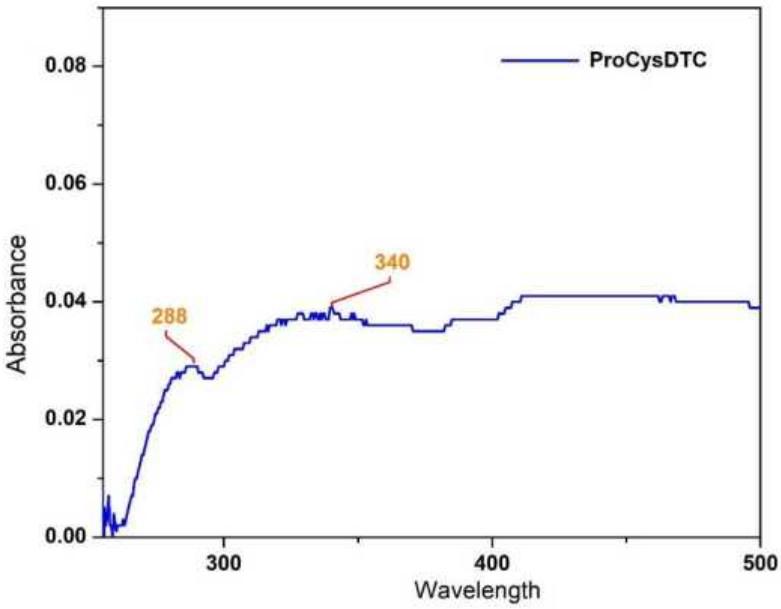


rum IR dari kompleks NiCoCysProDTC, NiProCysProDTC, dan
ArgDTC

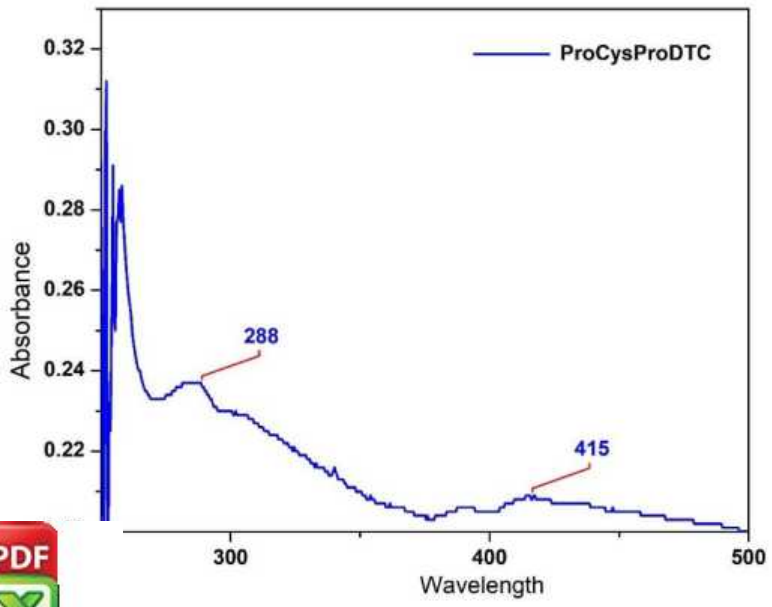


Gambar 168. Spektrum IR dari kompleks CoCysProDTC, CoProCysProDTC, dan CoCysArgDT

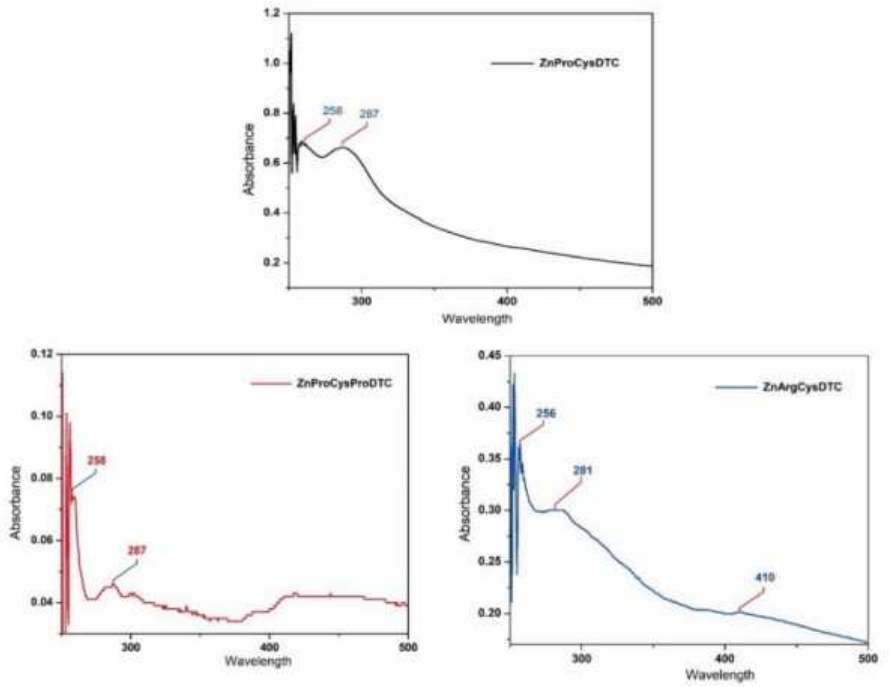
Lampiran 6. Hasil spektrum UV-Vis senyawa kompleks



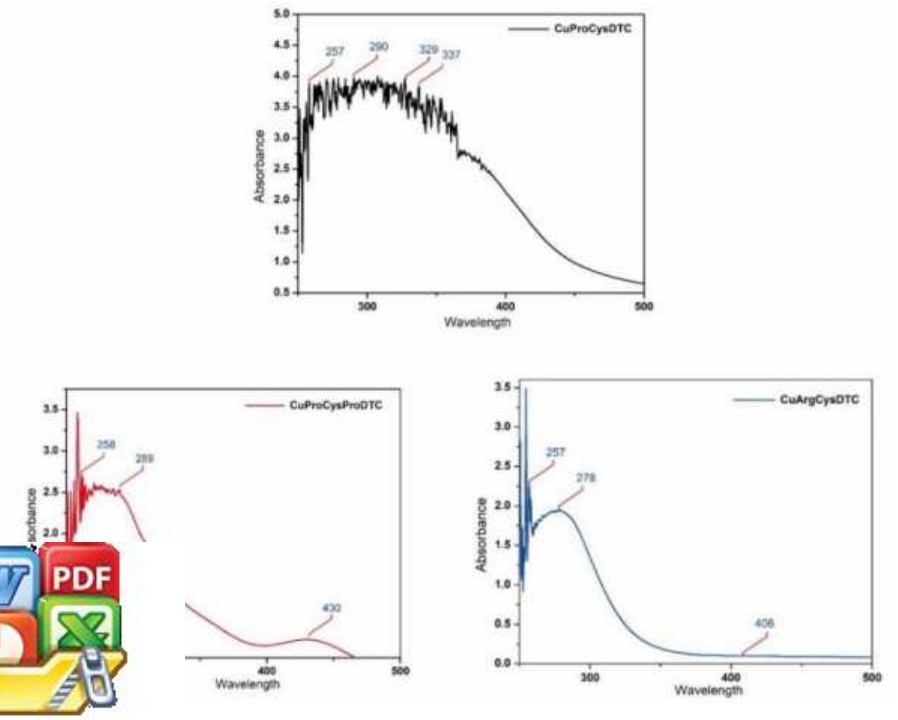
Gambar 169. Spektrum UV-Vis dari Ligan ProCysDTC



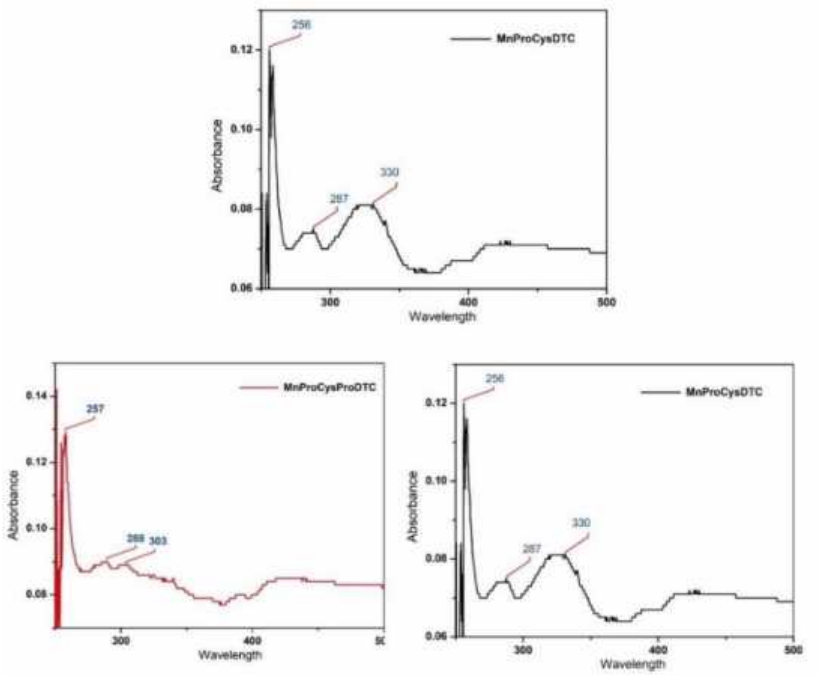
ım UV-Vis dari Ligan ProCysProDTC



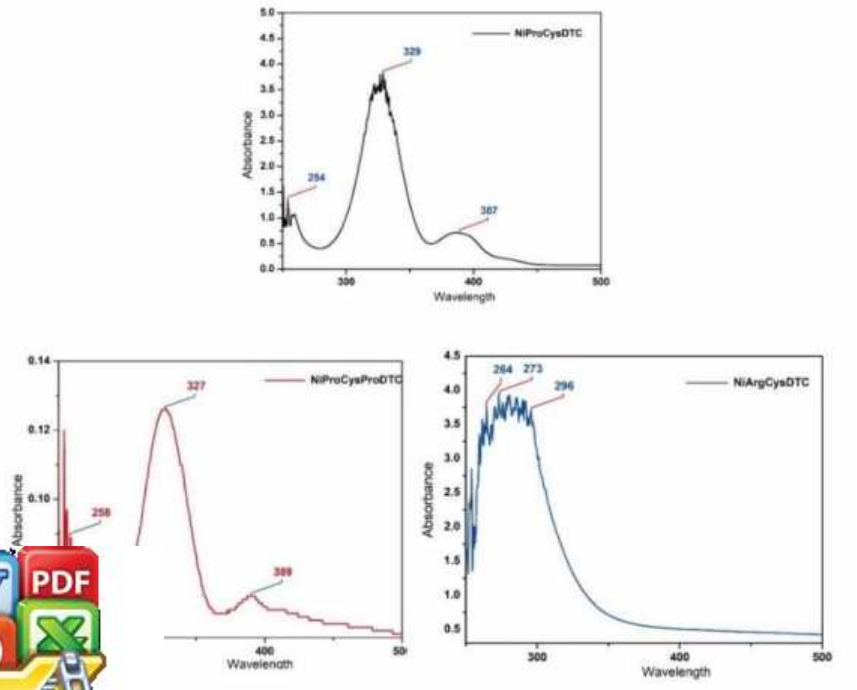
Gambar 171. Spektrum UV-Vis dari kompleks ZnCysProDTC, ZnProCysProDTC, dan ZnCysArgDTC



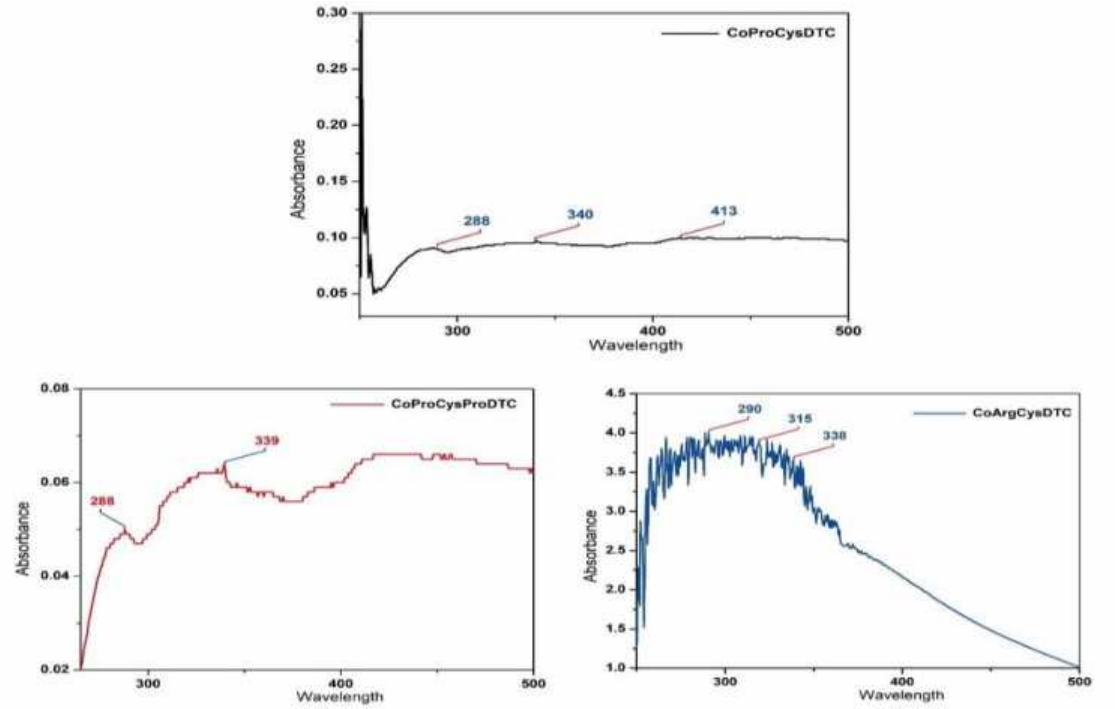
um UV-Vis dari kompleks CuCysProDTC, CuProCysProDTC, dan ArgDTC



Gambar 173. Spektrum UV-Vis dari kompleks MnCysProDTC, MnProCysProDTC, dan MnCysArgDTC



um UV-Vis dari kompleks NiCysProDTC, NiProCysProDTC, dan ArgDTC



Gambar 175. Spektrum UV-Vis dari kompleks CoCysProDTC, CoProCysProDTC, dan CoCysArgDTC

CURICULUM VITAE

A. Identitas Diri

1	Nama Lengkap (dengan gelar)	Rizal Irfandi, S.Si., M.Si.
2	Jenis kelamin	L/~~P~~
3	NIP/NIK/Identitas lainnya	NIK 7313021912940001
4	Pangkat/Golongan	Penata Muda Tingkat 1/III B
5	NIDN	NIDN 0919129401
6	Tempat & tanggal lahir	Teppobatu, 19 Desember 1994
7	Email	rizalirfandi043@gmail.com
8	Nomor telepon/ hp	085215254648
9	Nama institusi tempat kerja	Universitas Negeri Makassar
10	Alamat kantor	Jl. Daeng Tata, Makassar, Indonesia

B. Riwayat pendidikan

	S-1	S-2	S-3
Nama Perguruan Tinggi	Universitas Islam Negeri Alauddin Makassar	Universitas Hasanuddin	Universitas Hasanuddin
Bidang ilmu	Kimia Lingkungan	Kimia Organometalik	Kimia Organometalik
Tahun masuk – lulus	2012-2016	2017-2019	2021-sekarang
Judul skripis/Tesis/Disertasi	Fitoremediasi Tanaman Paku Pakis (*Pteris vittata*) Terhadap Limbah Merkuri (Hg) Sintetik	Sintesis Dan Karakterisasi Senyawa Kompleks Mg(II), Fe(II), Cu(II), Dan Zn(II) Dengan Sisteinditiokarbamat Serta Uji In Vitro Terhadap Sel Kanker Payudara (MCF-7)	Sintesis Dan Eksplorasi Aktivitas Antikaker Payudara (MCF-7) Dari Senyawa Kompleks Mn(II), Co(II), Ni(II), Cu(II), Zn(II) dengan Ligan Peptida-Ditiokarbamat Melalui Kajian *In-Vitro*, *Molecular Docking*, dan *Molecular Dynamic*
Nama Pembimbing/Promotor	Dr. Syamsidar HS, ST., M.T	Prof. Dr. Indah Raya, M.Si.	Prof. Dr. Indah Raya, M.Si.

C. Pengalaman Penelitian dalam 5 Tahun Terakhir

No	Tahun	Judul Penelitian	Pendanaan	
			Sumber	Jml (Juta Rp)
1	2020	Interaksi Kompleks Zn(II) dan Cu(II) Proline Ditiokarbamat dengan Sel Kanker Payudara: (Sintesis, Karakterisasi dan Uji In-Vitro terhadap sel MCF-7)	RISTEK-BRIN (Sebagai Kepala Program)	20
		Efek Sitotoksik dan Apoptosis Senyawa Kompleks Zn(II) pada Sel Line Kanker Payudara T47D dan Sel HeLa	LP2M UNHAS (Sebagai Anggota Program)	88

D. Publikasi Artikel Ilmiah Dalam Jurnal dalam 5 Tahun Terakhir

No	Judul Artikel Ilmiah	Nama Jurnal	Volume/Nomor/ Tahun
1	Eka Pratiwi, Indah Raya,* Hasnah Natsir, **Rizal Irfandi**, Paulina Taba, Rugaiyah Arfah, Herlina Rasyid, Yusafir Hala, Syahruddin Kasim, Andi Besse Khaerunnisa, Baso Ilham, Maulida Mazaya, Yosua Tanzil, and Dewi Luthfiana. Investigations of Ni(II)Cysteine-Tyrosine Dithiocarbamate Complex: Synthesis, Characterization, Molecular Docking, Molecular Dynamic, and Anticancer Activity on MCF-7 Breast Cancer Cell Line	Asian Pacific Journal of Cancer Prevention	**2024** doi: 10.31557/APJCP.2024.25.4.1301
2	Muhammad Nur, Andi Badli Rompegading, Muhammad Nasir, Ahmad Yani, **Rizal Irfandi***, Hilmi Magfirah Bachtiar, Siti Fauziah, Nur Insani Amir, Ayu Safitri Agustina, Vivi Dia Afrianti Sangkota, Syamsu Rijal Efficiency of Water Hyacinth (Eichhornia crassipes) in the Phytoremediation of Copper-Contaminated Waters of Lake Tempe, South Sulawesi Indonesia	International Journal of Design & Nature and Ecodynamics	**2024** https://doi.org/10.18280/ijdne.190337
3	**Rizal Irfandi**, Ahyar Raya, Indah, Ahmad, Ahmad Fudholi, Santi Riswandi, Santi, Azalea Wynda Puspa, Putri Suriati Eka, Alam Muhammad Nur, Unang Supratman, Olubode Samuel Olawale, A. Abdalrazaq Eid, Mahmoud Kandeel, Soekamto Nunuk Hariani, Hasnah Natsir, Maming, Ramlawati Design anticancer potential of Zn(II)isoleucinedithiocarbamate complex on MCF-7 cell lines: synthesis, characterization, molecular docking, molecular dynamic, ADMET, and in-vitro studies	Molecular Diversity	**2023** https://doi.org/10.1007/s11030-023-10747-y
4	Indah Raya, Desy Kartina, **Rizal Irfandi**, Sandi Sufiandi, Wijaya Ronald Ivan, Eid A Prihantono, Prihantono Abdalrazaq, awati Kandeel, Mahmoud and potential application for Mg(II) lithiocarbamate complex with r activity	Breast Disease	**2023** DOI: 10.3233/BD-239006

5	**Rizal Irfandi**, Indah Raya, Ahyar Ahmad, Ahmad Fudholid, Santi Santi, Wynda Puspa Azaleag, Dewi Ratih Tirto Sarih, Suriati Jarre, Sulistiani Eka Putri, Desy and Kartina Anticancer potential of Cu(II)prolinedithiocarbamate complex: design, synthesis, spectroscopy, molecular docking, molecular dynamic, ADMET, and in-vitro studies	Journal of Biomolecular Structure and Dynamics	**2023** https://doi.org/10.1080/07391102.2023.2169764
6	Dewi Luthfiana, Maratu Soleha, Andri Prasetiyo, Wisnu A. Kusuma, Rizka Fatriani, Lina Nurfadhila, Norainny Yunitasari, Ahmad H. Ahkam, Teresa L. Wargasetia, **Rizal Irfandi**, Arif N. M Ansori, Viol D. Kharisma, Sin W. Naw, Emdad Ullah, Vikash Jakhmola, Rahadian Zainul NETWORK PHARMACOLOGY AND MOLECULAR DOCKING STUDY TO REVEAL THE POTENTIAL ANTICANCER ACTIVITY OF OSCILLATOXIN D, E, AND F MARINE CYTOTOXINS	FOOD SYSTEMS	**2023** https://doi.org/10.21323/2618-9771-2023-6-3-365-389
7	Zainuddin, Andi Zulkifli Abdullah, Nurhaedar Jafar, Suriah, Nursalam, Darmawansyah, Syahrul Syahrul, Wahiduddin, Fransiskus Xaverius Widiantoro, **Rizal Irfandi** The application of social cognitive theory (SCT) to the mHealth diabetes physical activity (PA) app to control blood sugar levels of type 2 diabetes mellitus (T2DM) patients in Takalar regency	Journal of Public Health Research	**2023** https://doi.org/10.1177/22799036231172759
8	Suriati Eka Putri, Ahyar Ahmad, Indah Raya, Rachmat Triandi Tjahjanto, **Rizal Irfandi**, Harningsih Karim, Susilo Sudarman Desa, Abd Rahman The Effect of Thermal Treatment on the Characteristics of Porous Ceramic-Based Natural Clay and Chitosan Biopolymer Precursors	Indonesian Journal of Chemistry	**2023** https://doi.org/10.22146/ijc.80375
9	Muhammad Nasir, Dingse Pandiangan, arlein Mambu, Muhammad Nur, iah, **Rizal Irfandi*** ıediation potential of water (Eichhornia sp.), water spinach sp.), and apu wood (Pistia sp.)	AIP Conference Proceedings	**2023** https://doi.org/10.1063/5.0111213

	against metal ions Zn2+ in Tempe Lake, Wajo district, South Sulawesi		
10	Syamsidar Haji Syarifuddin, Asriani Hayatun, Ahyar Ahmad, Paulina Taba, Siti Fauziah, Dewi Sondari, Harningsih Karim, **Irfandi Rizal** Synthesis and Its Application as Packaging of Bioplastic from Rice Huck Cellulose Citrate Using Chitosan and Sorbitol Plasticizers	International Journal of Design & Nature and Ecodynamics	**2023** 10.18280/ijdne.180222
11	Suriati Eka Putri, Ahyar Ahmad, Indah Raya, Rachmat Triandi Tjahjanto, **Rizal Irfandi** Synthesis and antibacterial activity of chitosan nanoparticles from black tiger shrimp shell (Penaeus monodon)	Egyptian Journal of Chemistry	**2023** 10.21608/ejchem.2022.148340.6417
12	Indah Raya, Desy Kartina, Ronald Ivan Wijaya, **Rizal Irfandi**, Eid A Abdalrazaq, Prihantono Prihantono, Santi Santi, Eka Pratiwi, Andi Besse Khaerunnisa, Dewi Luthfiana, Bulkis Musa, Hasnah Natsir, Maming Maming, Zaraswati Dwyana Zainuddin, Ramlawati Ramlawati, Ahmad Fudholi, Andi Nilawati Usman, Unang Supratman, Maulida Mazaya, Sandi Sufiandi Novel Complex of Zinc (II) Dichloroethylenediamine: Synthesis, Characterization, In-silico, and In-vitro Evaluation against Cervical Cancer Cells	Asian Pacific Journal of Cancer Prevention	**2023** doi: 10.31557/APJCP.2023.24.12.4155
13	Maming Maming, Fadliah Mubakir, Indah Raya, Bulkis Musa, Anshar Andi Muhammad, Erna Mayasari, Yusafir Hala, Syaharuddin Kasim, Andi Ilham, Gemini Alam, Usman Andi Nilawati, Hasmawati Hasmawati, Hasri Hasri, Andriani Usman, **Rizal Irfandi** Fabrication and analysis of nano-hydroxyapatite [Ca10(PO4)6(OH)2] composites with collagen derived from eggshells through freeze-drying	Eurasian Chemical Communications	**2023** DOI: 10.48309/jmpcr.2023.182241
14	Andi Badli Rompegading, Hamza, Muhammad Arafah, Hairil Akbar, Safrudin Tolinggi, Ahmad Yani, ıad Nur, Syamsu Rijal, Ahmad **Rizal Irfandi** of Moringa Seed (Moringa Extract as a Natural Coagulant	International Journal of Design & Nature and Ecodynamics	**2023** https://doi.org/10.18280/ijdne.180120

	to Reduce the Turbidity Level of Worongnge Village River Water		
15	Sulistiani Jarre, Indah Raya, Prihantono Prihantono, Rugaiyah Arfah, Maming Gappa, Siti Fauziah, Santi Santi, **Rizal Irfandi.** Synthesis, characterization, potential anticancer activity, and molecular docking studies of Fe (II) Prolinedithiocarbamate complex on MCF-7 breast cancer cell lines	Egyptian Journal of Chemistry	**2023** 10.21608/ejchem.2022.149508.6466
16	**Rizal Irfandi**, Santi Santi, Indah Raya, Ahyar Ahmad, Ahmad Fudholi, Dewi Ratih Tirto Sari. Study of new Zn (II) Prolinedithiocarbamate as a potential agent for breast cancer: Characterization and molecular docking	Journal of Molecular Structure	1252 (**2022**), 132101 https://doi.org/10.1016/j.molstruc.2021.132101
17	Subakir Salnus, Wahid Wahab, Rugaiyah Arfah, Firdaus Zenta, Hasnah Natsir, Muriyati Muri, Fatimah Fatimah, Arini Rajab, Zulfian Armah, **Rizal Irfandi.** A Review on Green Synthesis, Antimicrobial Applications and Toxicity of Silver Nanoparticles Mediated by Plant Extract	Indonesian Journal of Chemistry	22(4) **(2022)** https://doi.org/10.22146/ijc.71053
18	**Rizal Irfandi**, Riswandi Riswandi, Indah Raya, Ahyar Ahmad, Ahmad Fudholi, Sulistiani Jarre, Dewi Ratih Tirto Sari, Santi Santi, Ronald Ivan Wijaya, Prihantono Prihantono. A New Complex Design of Fe (II) Isoleucine Dithiocarbamate as a Novel Anticancer and Antivirus against SARSCOV-2 (COVID-19)	Asian Pacific Journal of Cancer Prevention	23(9) **2022** 10.31557/APJCP.2022.23.9.3113
19	**Rizal Irfandi**, Indah Raya, Ahyar Ahmad, Ahmad Fudholi, Hasnah Natsir, Desy Kartina, Harningsih Karim, Santi Santi, Subakir Salnus. Review on Anticancer Activity of Essential Metal Dithiocarbamate Complexes	Indonesian Journal of Chemistry	**2022** https://doi.org/10.22146/ijc.73738
	ıad Nur, Muhammad Nasir, **'andi**, Ahmad Yani, Siti Fauziah, ınur, Riny Febriani, Raya, 'udholi.	International Journal of Design & Nature and Ecodynamics	17(5) **2022** https://doi.org/10.18280/ijdne.170507

	Phytoremediation of Zinc, Copper, and Lead Using Ipomoea Aquatica in Water Contaminants		
21	Muhammad Nasir, Muhammad Nur, Dingse Pandiangan, Susan Marlein Mambu, Siti Fauziah, Indah Raya, Ahmad Fudholi, **Rizal Irfandi.** Phytoremediation Study of Water Hyacinth (Eichhornia Crassipes) on Zinc Metal Ion (Zn2+)	International Journal of Design & Nature and Ecodynamics	17(3) **2022** https://doi.org/10.18280/ijdne.170312
22	**Rizal Irfandi**, Muhammad Ilham, Erwing, Ruslang, Muhammad Arafah, Andi Badli Rompegading, Putri Suriati Eka, Sartika Suriana Dwi, Siti Fauziah, Ayu Safitri Agustina, Hairil Akbar, Ahmad Fudholi Review on Curcumin Compounds in Turmeric Plants for the Treatment of COVID-19	International Journal of Design & Nature and Ecodynamics	**2022** https://doi.org/10.18280/ijdne.170618
23	Prihantono Prihantono, **Rizal Irfandi,** Indah Raya. The comparison of Zn (II) arginine dithiocarbamate cytotoxicity in T47D breast cancer and fibroblast cells	Breast Disease	40(s1) **2021** DOI: 10.3233/BD-219008
24	**Rizal Irfandi**, Ruslang Ruslang, Indah Raya, Ahmad Yani, Muhammad Nasir, Nurcaya Nurcaya, Sulistiani Jarre. Docking Molecular dari Kompleks Zn (II) Amina (Prolin) dithiokarbamat terhadap Reseptor Estrogen-α	Al-Kimia	9(2) **2021** https://doi.org/10.24252/al-kimia.v9i2.23949
25	Muhammad Nasir, Dingse Pandiangan, Susan Marlein Mambu, Muhammad Nur, Siti Fauziah, Nur Insani Amir, **Rizal Irfandi**, Sahriah Rahim. Potensi Kayu Apu (Pistia stratiotes) di Perairan Danau Tempe Kabupaten Wajo, Sulawesi Selatan Sebagai Agen Fitoremediasi Terhadap Ion Logam Cu2+	Al-Kimia	9(1) **2021** https://doi.org/10.24252/al-kimia.v9i1.17969
26	Desy Kartina, A W Wahab, Akhyar Ahmad, **Rizal Irfandi**, Indah Raya. In vitro antibacterial and anticancer activity of Zn(II)Valinedithiocarbamate es.	Journal of Physics: Conference Series	1341(3) **2019** 10.1088/1742-6596/1341/3/032042
	andi, Prihantono, Indah Raya, rtina, Riswandi.	1st International Conference on Science and Technology, ICOST 2019, 2-3 May, Makassar, Indonesia	**2019** http://dx.doi.org/10.4108/eai.2-5-2019.2284628

	Synthesis, Characterization and Anticancer Studies of Fe(II)Cysteinedithiocarbamate Complex		
28	**Rizal Irfandi**, Prihantono, Indah Raya. Synthesis, Characterization And Cytotoxic Activity Of Zn(II) Cysteine Dithiocarbamate In Breast Cancer (MCF-7)	INTERNATIONAL RESEARCH JOURNAL OF PHARMACY	10 (4) **2019** DOI: 10.7897/2230-8407.1004126
29	Desy Kartina, Wahid Wahab, Ahyar Ahmad, Indah Raya, **Rizal Irfandi.** Synthesis and Characterization Zn(II)LeucinDithiocarbamate Complex and Their Potential as Anti-Tuberculosis	1st International Conference on Science and Technology, ICOST 2019, 2-3 May, Makassar, Indonesia	**2019** DOI 10.4108/eai.2-5-2019.2284675
30	Riswandi Riswandi, Prihantono Prihantono, Indah Raya, **Rizal Irfandi.** Potential of Breast Anticancer Compounds (MCF-7) from Synthesis Results and Characterization of Complex Compounds of Mg(II) Isoleucinedithiocarbamate	1st International Conference on Science and Technology, ICOST 2019, 2-3 May, Makassar, Indonesia	**2019** DOI 10.4108/eai.2-5-2019.2284630

E. Pemakalah Seminar Ilmiah (Oral Presentation) dalam 5 Tahun Terakhir

No	Nama Temu Ilmiah/ Seminar	Judul Artikel Ilmiah	Waktu dan Tempat
1	ICER-PH	Anticancer potential of Cu(II)prolinedithiocarbamate complex: design, synthesis, spectroscopy, molecular docking, molecular dynamic, ADMET, and in-vitro studies	UNHAS, 2022
2	The 4th International Conference on Science (ICOS 2020)	New potential application for Mg(II) cysteine dithiocarbamate complex with anticancer activity	UNHAS, 2021
3	ICOST	Synthesis, Characterization and Anticancer Studies of Fe(II)Cysteinedithiocarbamate Complex	UINAM, 2019
4	In the 4th International Conference on Life Sciences and Technology	Phytoremediation Potential of Water Hyacinth (Eichhornia sp.), Water Spinach (Ipomea sp.), and Apu Wood (Pistia sp.) Against Metal Ions Zn2+ in Tempe Lake, Wajo District, South Sulawesi	Universitas Negeri Malang, 2021
	Conference on Research stry and Chemical ı (JCRCCE) 2022	Design Anticancer Potential of Zn(II)Isoleucinedithiocarbamate Complex on MCF-7 Cell Lines: Synthesis,	Indonesian Chemical Society (HKI) West Java-Banten and Department of chemistry,

		Characterization, Molecular Docking, Molecular Dynamic, ADMET, and In-Vitro Studies	Indonesia University of Education

F. **Karya Buku dalam 5 Tahun Terakhir**

No	Judul Buku	Tahun	Jumlah Halaman	Penerbit
1	Belajar dan Pembelajaran	2024	182	Pustaka Madani
2	BIOMEDIK	2023	433	CV. MEDIA SAINS INDONESIA
3	Buku ajar biokimia	2023	102	Pustaka Madani
4	Pelestarian Lingkungan dan Partisipasi Masyarakat: Pengetahuan, Self-efficacy, Motivasi, dan Sikap	2023	125	Bintang Semesta Media
5	STUDI IN-VITRO KOMPLEKS Mg(II), Fe(II), Cu(II), dan Zn(II) DITIOKARBAMAT SEBAGAI ANTIKANKER PAYUDARA	2022	98	Bintang Semesta Media
6	Buku ajar pengantar fitoremediasi	2021	89	Delta Pijar Khatulistiwa

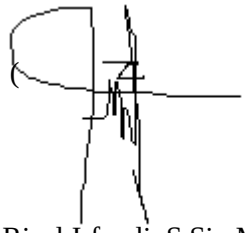
G. Perolehan HKI dalam 10 Tahun Terakhir (dri)

No	Judul/Tema HKI	Tahun	Jenis	Nomor P/ID
1	Cytotoxic Effects of Mn(II)Arginin Dithiocarbamate Complex Compounds On Breast Cancer (MCF-7) Cell Lines	2019	HKI	Granted No ID 000187101
2	Cytotoxicity of Zn(ll) Arginine Dithiocarbamate for breast cancer T47D and Fibroblast Cells	2020	HKI	Granted No ID 000189092
3	STUDI IN-VITRO KOMPLEKS Mg(II), Fe(II), Cu(II), DAN Zn(II) DITIOKARBAMAT SEBAGAI ANTIKANKER PAYUDARA	2022	HKI	Granted No ID 000337472
4	The New Potential Application For Mg(II) Cysteinedithiocarbamate Complex icancer Activity	2023	HKI	Granted No ID 000483940
	And Characterization Of Nano-patite [Ca10(PO4)6(OH)2] Shell Where Composited With	2023	HKI	Granted No ID 000546281

	Collagen Using Freeze-Drying Method			
6	Investigations Of Ni(II)Cysteine-Tyrosine Dithiocarbamate Complex: Synthesis, Characterization, Molecular Docking, Molecular Dynamic, And Anticancer Activity On MCF-7 Breast Cancer Cell Line	2024	HKI	Granted No ID 00640198

Semua data yang sudah saya isikan dan tercantum dalam biodata ini adalah benar dan dapat dipertanggungjawabkan secara hukum. Apabila di kemudian hari ternyata dijumpai ketidaksesuaian dengan kenyataan, saya sanggup menerima sanksi.

Makassar, 10 Agustus 2024



Rizal Irfandi, S.Si., M.Si.)