

DAFTAR PUSTAKA

- Amaral, Alírio E.R., M. Filomena., Barreiro..2012, Fungal degradation of lignin-based rigid polyurethane foams. *Polym Degradat Stab.* 97: 2069-2076.
- Andriany. Pengaruh jenis bioaktivator terhadap laju dekomposisi seresah daun jati *Tectona grandis* L.f Di wilayah Kampus Unhas Tamalanrea. 2012. *J.Appl. Sci.* 2: 535-548.
- Ahn, Jaewoong. L., Chankyu K. 2018. Physico-chemical properties of new composite polymer for heat resistance with thin-film form through the blending of m-aramid and polyurethane. *J.Polymer.* 23:17-23.
- Alexandro, Xiu Shing., M Jian J.Y., Chirts D. M. 2005. Carbamazepine and Its Metabolites in Wastewater and in Biosolids in a Municipal Wastewater Treatment Plan. *Environ Sci. Technol.* 39:7469-7475.
- Anonim. 1995. Farmakope Indonesia edisi IV. Departemen Kesehatan RI. Jakarta.
- Azhrman. 2002. Aplikasi nanotekhnologi dalam bidang kesehatan. Tesis tidak diterbitkan. Medan. FMIPA Universitas Andalas.
- Barrioni, Sandhra M. C., Rodrigo O., Agda A.R., Oliveira M., Magalhaes P.2015. Synthesis and characterization of biodegradable polyurethane films based on HDI with hydrolyzable crosslinked bonds and a homogeneous structure for biomedical applications. *J.mater. Sci. Eng. C-52:* 22-30.
- Biffinger, Wendy J., Goodson. 2014. A direct quantitative agar-plate based assay for analysis of *Pseudomonas protegens* Pf-5 degradation of polyurethane films. *Int. Biodeterior. Biodegrad* 95:311-319.
- Budiyono, 2016. Polymer tekhnik mesin ed Diposting 12 Oktober 2016 6.13. file:///C:/Users/DELL/Documents/kabul%20budiyono
- Bhuvanewari. 2018. 3. Degradibility of polymer, *J. Recycling of polyurethane Foams*, 29-44.

ntini, Jody C.M. John A.M, David M.H. 2019. Mass spectrometry of polyurethanes. *J.Polym.* 181:1-13.



- Chen, George, A.T. 2013. Elastomeric biomaterial for tissue engineering. *J.Prog. Polym. Sci.* 38: 584-671.
- Chen, K, Harris,K, Sergey,V..2007. Tacticity as a factor contributing to the thermal stability of polystyrene.*J.Macromol Chem.*208.(23):2525-2532.
- Duan dan Jiang . 2016. Synthesis and simultaneous self-assembly of novel antibacterial polyurethane. *IOP Conf. Ser. Mater. Sci. Eng.* 137 012028
- Fardiaz. S. 1989. Mikrobiologi Pengolahan Pangan 1nd ed (Food Processing Microbiology). Indonesia: Pangan dan Gizi IPB Books.
- Francolini , A..Piozzi. 2016. Antimicrobial polyurethanes for intravascular medical devices. *Adv. Polyurhetane Biomater.*349-385.
- Fei, Seyed M.S., Andreas K. 2014. UV-stable paper coated with APTES-modified P25 TiO₂ nanoparticles. *Carbohydr polym.* 114 (19):246-252.
- Hadisoewignyo, Kuncoro, F, Raymond, R.T. 2017. Isolation and characterization of agung banana peel starch from east Java Indonesia. *Int. Food Res. J* 24 (3): 124-133
- Huerta, Cervantes,B.G. O, Hernández, T.J, García, G L, Vega, R, Herrera, May .2014. Biocompatibility and surface properties of TiO₂ films deposited by DC magnetron sputtering. *Materials.* 7: 4105-4117.
- Heru dan Rohaeti. 2011 Bioplastik nata de cassava sebagai bahan edible film ramah lingkungan. *Jurnal Penelitian Saintek*, 16 (2):172-190.
- Iswarin, Nuriyah.L, Sriwilujeng, A.I 2013. Hubungan gugus fungsi plastik biodegradable metil akrilat dari pati Garut dan sifat mekaniknya. *J.Natural.B.2* (2).178-183.
- Jawetz,1995. Mikrobiologi Kedokteran. Edisi ke-20 (Alih bahasa : Nugroho & R.F.Maulany).Jakarta : Penerbit Buku Kedokteran EGC. hal. 211-215.
- Kay, Morton, G, Prince, E.L. 1991. Bacterial degradation of polyester polyurethane. *Int. Biodeter.* 27 (2): 205-222.



- Keller, Elizangela.A,Vinicius M. O, Mariana M.G, Gizilene, Mariade C, Juliana C.G. 2020. Polyurethane foams synthesis with cassava waste for biodiesel removal from water bodies *Bioresource Technol. Rep* 10: 1-5
- Khan, Sadia,N, Zia U. S, Aamer A.S, Samantha C.K,Jianchu X, Afsar K, Shahzad M,Fariha, H et al, 2017. Biodegradation of polyester polyurethane by *Aspergillus tubingensis*. *J. Environ. Poll.* 30:1-12.
- Kyan, Hari Susanti. 2016. Perbandingan Metode Somogyl dan Anthrone Sulfat Pada Penetapan Kadar Gula Pereduksi Dalam Umbi Cilembu (*Ipomea batatas L.*). *Jurnal Farmasi Sains dan Komunitas.* 13(2) 81-89.
- Kumar, Reumender, K ,2013. Effect of different formulations of MDI on rigid polyurethane foams based on castor oil . *IJSRR*, 2(1) Suppl., 29- 42.
- Kupka,Lucy, V, Zdenka, F, Josef,J. 2016, Solvent free synthesis and structural evaluation of polyurethane films based on poly(ethylene glycol) and poly(caprolactone). *Express Polym. Lett.*10(6): 479–492.
- Kindayani, N. W. 2008. Pemanfaatan bonggol pisang untuk pembuatan asam phospat, (Utilization of banana humps for the manufacture of phosphoric acid). *Jurnal Widya Tekhnik.* 6(2):136-140.
- Kianpour, Reza, B, Ali, P, Hossein, G. 2020. In situ synthesized TiO₂-polyurethane nanocomposite for bypass graft application:in vitro endothelialization and degradation. *J. Mater. Sci. Eng.* 114. 1-10
- Larusso, Viviana V, Annagrazia M, Antonio S, Giuseppe C, Paolo M.C, Barbara. 2015. Characterization of PU foamadded with synhesied acetit and oleic- modifiled TiO₂ nanocrystal . *J. Mater. Sci. Eng.* 5(26): 1-7.
- Li, Y Wanxuan, K, James O. S,Benjamin C.1994. Effect hard segment flexibility on phase separation of segmented PU. *J. Macromolecul.*27(2).612-614.

hini, Wong Q, A., Sain, R J. 2013. Identification of esterase in *spergillus flavus* during degradation of polyester polyurethane. *Canadian young Scie J.* 24-31



- Mas, L Valverde, S , L.A., Sarabia, Ortiz, M,C. 2015. Impact of the pretreatment of ATR-FTIR signals on the figures of merit when PLS is used. *J. Chemometrics and Intelligent Laboratory system* 15: 1-26.
- Mursalim, 2018. Pemeriksaan angka lempeng total bakteri pada minuman sari kedelai yang diperjualbelikan di Kecamatan Manggala Kota Makassar. *Jurnal Media Analisis Kesehatan*, 1.(1): 56-61.
- Nakkabi, A., Najim, I., Mohamed D, Encarnación M. D, Mohammed Fahim. 2015 a. Growth of *Pseudomonas* in polyurethane medium. *IOSRJEN*) 5: 36-40
- Nakkabi, A., Moulay, S., Saad, I., Mohammed, F. 2015 b. Biological degradation of poliuretan by a newly Isolated wood bacterium,International. *Journal of Recent Advances in Multidisciplinary Research*.02:0222-0225.
- Ordon, K., Monika, S, Piotr, S., Kinga, P.2019. Examining the effect of starch and hydroxyapatite crosslinking on the thermal properties of polyurethane-based biomaterials. *Thermochimica acta*..682:1-9.
- Ozdil, Wimpenny, Aydin H.M, Y.Yang. 2017. Biocompatibility of biodegradable medical polymers. *.Science and Principles of Biodegradable and Bioresorbable Medical Polymers* 5.(1): 379-414.
- Pramadewi dan Wahyuni, S. 2015. Sintesis nanokomposit TiO₂/ SiO₂-PVA dan aplikasinya sebagai antibakteri. *Indonesian Journal of chemical science*. 4 (2).1-5.
- Peter, A., James, A. L., Jaap, J.B. 1990. High Performance Liquid Chromatography Chemical Ionization Mass Spectrometric Analysis of Pyrolysates of Amylose and Cellulose. *Anal Chem*. 62. 14: 1519-1522.
- Pelliasari, Margarita, M.A.M.,Paulo, J.A.,Sobral, F Cecilia M. 2012. Isolation and characterization of the flour and starch of plantain bananas (*Musa paradisiaca*). *J. Starch/Starke*. 64: 382–391.

ani. 2015. Uji Daya Antibakteri Bawang Putih (*Allium sativum*).Terhadap antibakteri *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhimurium* dan *Pseudomonas aeruginosa* dalam meningkatkan keamanan pangan *J.Informatika Pertanian* : 24 (1): 53 – 58.



- Ratnakara, Prasad, K..H, Vivekananthan, S, Karthika,P.C, Aashutosh K. 2016. Synthesis and characterization of polyurethane-titanium dioxida-hydroxyapatite. *J.Material Today*. 10: 4052-4057.
- Rohaeti dan Surdia 2003. Pengaruh Variasi Berat Molekul Polietilen Glikol terhadap Sifat Mekanik Poliuretan. *Jurnal Matematika dan Sains* .8 (2): 63 – 66.
- Rohaeti, E. 2001. Biodegradasi poliuretan hasil sintesis dari asam oleat, polioksietilen glikol, dan metilen-4,4'-difenildiisosiolat. prosiding seminar nasional Kimia dan Pendidikan Kimia 2010. K.239-K247.
- Rofika. 2013. Pemanfaatan pektin kulit pisang kepok (*Musa paradisia linn*) untuk pembuatan Edible Film, (Utilization of Kepok Banana Skin Pectin (Musa Paradisiaca Linn) for Making Edible Films. Skripsi tidak dipublikasikan. FMIPA, Unis.
- Rochicka,P.,Agata Markoswa S.L.K.,Ewa K Antoni W. 2016. Influence of titanium dioxide modification on the antibacterial properties. *Polish Journal of Chemical technology* 18. 56-64.
- Rohmi, 2011. Pembuatan polyol dari asam oleat sebagai bahan baku untuk menghasilkan flexible poliuretan. Tesis tidak dipublikasikan. Tesis PPs UMI, Makassar.
- Rohmi, Ahyar Ahmad, Firdaus, Paulina Taba. 2020. Characterization and TiO₂- Catalyzed Degradation of Polyurethane Biopolymer Through Medium Pro Compost. *Oriental Journal of Chemistry*, 36(1), 161-165
- Sartini, Djide, N, G.Alam 2008. Aktivitas antibakteri ekstrak kulit buah kakao (*Theobroma cacao* L.) terhadap *Escherichia coli*, *Bacillus subtilis*, dan *Staphylococcus aureus*. *J.Menara Perkebunan*.80.(2) 34-42
- Saragih .2013. Analisis mutu tepung bonggol pisang dari berbagai varietas dan umur panen yang berbeda. *Journal JTIBBS*. 1 Vol. (1):22-29



- Shen, Jaliang He, Zhenxing. X. Xing, Z. Changqing, F,Chaoqun, Z. 2019. Synthesis and characterization of vegetable oil based polyurethanes with tunable thermomechanical performance. *J.Industrial Crops and Products*.140: 1-5.
- Sri, H., Anggi, Septi. R, Yuni. S. 2017. Pemanfaatan biji durian sebagai bahan baku plastik biodegradable dengan plasticizer gliserol dan daun bahan pengisi CaCO₃, (Utilization of durian seeds as biodegradable plastic raw material with plasticizer glycerol and leaf filling material CaCO₃). *Jurnal Teknik Kimia*. 1(23): 1-8.
- Singh,Rajendra S, Manoj, K, Anshumali, M ,Praveen K.M. 2016, Microbial enzymes: industrial progress in 21st century. *J. 3 Biotech_6(2)*. 174.
- Shintiani, Akitada, N. 1991. Formation of 4,4'-methylenedianiline in polyurethane potting materials by either y-ray or autoclave sterilization. *J. Journal of Biomedical Materials Research*.25: 1275-1286.
- Sikong, Jiraporn, D , Kalayanee, K, Sutham, N. 2012. Effect of doped SiO₂ and calcinations temperature on phase tranformation of TiO₂ photocatalys by sol-gel methode. *Journal of science and technology*. 3(30): 385-391.
- Spontón, Casis, N, Mazo, P. Raud, B, Simonetta, A. 2013. Biodegradation study by *pseudomonas* sp. of flexible polyurethane foams derived from castor oil.*Journal International Biodeterioration & Biodegradation* 85: 85-94
- Sulaiman, , Shahzad M. K , Tahir, J , Waqas, A , Muhammad S , Nafisa, G.2014, Synthtusesis and Characterization of Flexible and Rigid Polyurethane Foam . *Asian Journal of Applied Sciences*. 2:1-11.
- Suhaerah, Tutik K, Ade R, Burhanuddin, R ,2018. The Effect of Organic Medium Use in Formulation Of Trichoderma Harzianum And Pleurotus Ostreatus In Viability And Decomposition Of Cacao Pod Husks Waste. *J.Biotechnol*.15(1): 107-112.
- Tai, Raju,A,Robert,S Benu,A. 2017. Flexible starch-polyurethane films: physiochemical and hydrophobicity characteristics. *J. Karbohidrat Polimer* 163: 236-246.

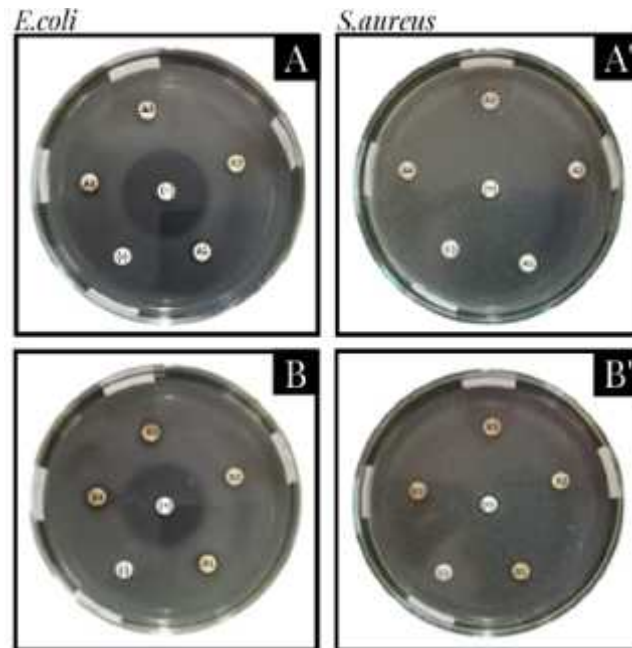


2013 Self-cleaning polyurethane and polyester coatings , Electronic Thesis and Dissertation Repository. Self-cleaning polyurethane and polyester coatings , Electronic Thesis and Dissertation Repository, The University of Western Ontario., International Journal of

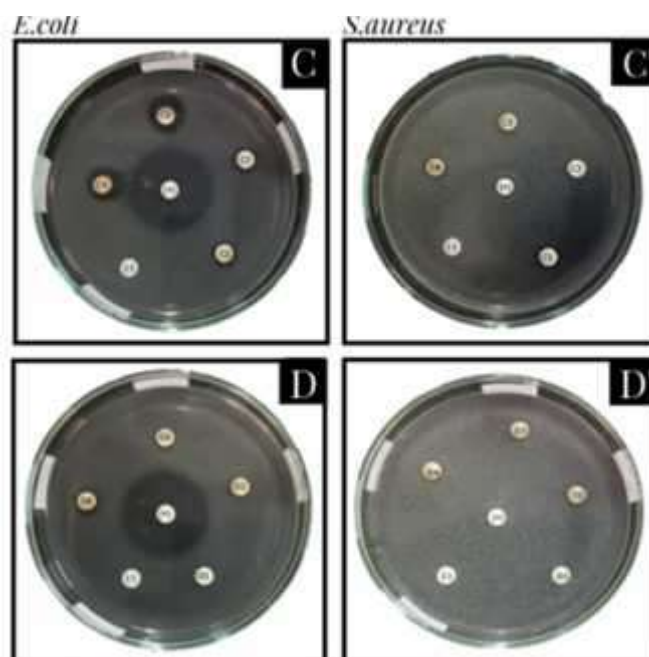
- Bioassays with local additives Journal of Biology, Agriculture and Healthcare..3106-3110.
- Tolstov, Matyushov V. F., Klymchuk, D. O. 2008. Synthesis and characterization of hybrid cured poly(ether-urethane)acrylate/titania microcomposites formed from tetraalkoxytitanate precursor. *J.Express Polymer Letters*.2.(6): 449–459.
- Tong, Joshua, S.D, Emily E, Thomas, L.H, Vance, G.F. 2015. *Staphylococcus aureus* Infections: Epidemiology, Pathophysiology, Clinical Manifestations, and Management. *J.Clinical Microbiology*. 28(3): 603–661.
- Oktaviani, Muspiah, A, Faturrahman..2020. Antibacterial Activities of Ethanol Extract Ganoderma sp. Origin of Lombok Island. *JSTL* vol 6(1).22-28.
- Utami, 2016. *Uji Daya Hambat Ekstrak Metanol Biji Jintan Hitam (Nigella Sativa L) terhadap Bakteri Streptococcus Mutans*. Undergraduate (S1) thesis, Universitas Islam Negeri Alauddin Makassar. <http://repositori.uin-alauddin.ac.id/id/eprint/4955>.
- Vinale, Krishnapillai, S, Emilio, L.G, Roberta, M, Sheridan .2008. *Trichoderma* plant–pathogen interactions. *J. Soil Biology and Biochemistry*. 40.(1): 1-10.
- Xing, XihongLi ,LiZhang, Qinglian Xu, Zhenming Che, WeiliLi, Yumin, B. K. 2012. Effect of TiO₂ nanoparticles on the antibacterial and physical properties of polyethylene-based film. *J.Progress in Organic Coatings* 73: 219-224.
- Zafar, Ashley, H., Geoffrey, D.R.2013, Fungal Communities Associated with the Biodegradation of polyester Polyurethane Buried Under Compost at Different Temperatures. *Appl. Environ. Microbiol.* 79: 7313-7324.
- Zafar, Petrus, N., Adrian, L., Ashley, H., Alan, H., Alberto. 2014 Biodegradation of Polyester Polyurethane During Commercial. *J. Bioresource Technology* .158.:374-377.



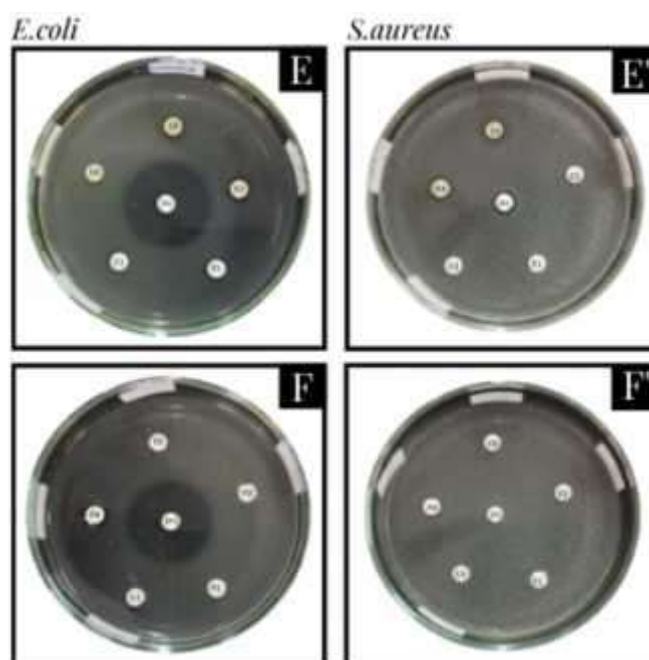
Lampiran 1 Aktivitas antibakteri poliuretan yang disintesis PU-pati BPK 15%-TiO₂ 1%(A) dan PU-Pati BPK 15%-TiO₂ 1,5% terhadap bakteri *S.aureus*.



Lampiran 2 Hasil uji antibakteri PU-Pati BPK-TiO₂ 2% (C) dan PU-Pati BPK-TiO₂ 2,5% (D) dengan metode difusi agar



Lampiran 3 Uji antibakteri PU-Pati BPK15%(E) dan PU-Amilum 15% (F) dengan menggunakan metode difusi agar



Lampiran 4. Persentase kehilangan massa poliuretan yang disintesis dari PEG, Pati BPK, MDI dan TiO₂ tanpa Pemendaman

No	Berat Kertas (g)	Berat PU +Kertas (g)	Massa PU (Awal) (g)	Massa PU (akhir) (g)	Kehilangan Massa (%) (g)	Degradabilitas (g/Hari)	Lama Inkubasi (Hari)
1	1,0259	9,8142	8,7883	8,7883	0,0000	0,0000	7
2	0.5016	4,6456		8,7882	0,0001	0,0001	14
3	0,4581	3,0600		8,7883	0,0000	0,0000	21
4	0,5203	1,5219		8,7882	0,0001	0,0001	28
5	0,5112	1,5128		8,7883	0,0000	0,0000	35



Lampiran 5. Persentase kehilangan massa poliuretan yang disintesis dari PEG, Pati BPK ,dan MDI tanpa Pemendaman

No	Berat Kertas (g)	Berat PU +Kertas (g)	Massa PU (Awal) (g)	Massa PU (akhir) (g)	Kehilangan Massa (%) (g)	Degradi bilitas (g/Hari)	Lama Inkubasi (Hari)
1	1,0209	9,6355	8,6096	8,6095	0,0001	0,0001	7
2	0.5016	4,6456		8,6096	0,0000	0,0000	14
3	0,4581	3,0600		8,6095	0,0001	0,0001	21
4	0,5203	1,5219		8,6096	0,0000	0,0000	28
5	0,5112	1,5128		8,6096	0,0000	0,0000	35

Lampiran 6. Persentase kehilangan massa poliuretan yang disintesis dari PEG, Pati Amilium, dan MDI tanpa pemendaman

No	Berat Kertas (g)	Berat PU +Kertas (g)	Massa PU (Awal) (g)	Massa PU (akhir) (g)	Kehilangan Massa (%) (g)	Degradi bilitas g/Hari)	Lama Inkubasi (Hari)
1	1,0259	9,5244	8,4985	8,4985	0,0000	0,0000	7
2	1,0090	9,5044		8,4985	0,0000	0,0000	14
3	0,9967	9,4952		8,4984	0,0001	0,0001	21
4	0,9896	9,4881		8,4985	0,0000	0,0000	28
5	1,0174	9,5159		8,4984	0,0001	0,0001	35

Lampiran 7. Persentase kehilangan massa poliuretan yang disintesis dari PU-Pati BPK 15%- TiO₂ 2% dengan pemendaman

No	Berat Kertas (g)	Berat PU +Kertas (g)	Massa PU (Awal) (g)	Massa PU (akhir) (g)	Kehilangan Massa (%) (g)	Degradi bilitas g/ hari)	Lama Inkubasi (Hari)
1	0.4523	6,7990	6,3467	5,2196	0,1775	0,1610	7
2	0.5000	4,4213		3,8605	0,3917	0,1776	14
3		2,8322		2,3821	0,6246	0,1888	21
4		1,3627		0,7915	0,8752	0,1987	28
5		1,2901		0,7915	0,8752	0,1587	35



Lampiran 8. Persentase kehilangan massa poliuretan yang disintesis dari PEG, Pati BPK, dan MDI dengan pemendaman

No	Berat Kertas (g)	Berat PU +Kertas (g)	Massa PU (Awal) (g)	Massa PU (akhir) (g)	Kehilangan Massa (%) (g)	Degradi bilitas g/ hari	Lama Inkubasi (Hari)
1	0,5607	6,8639	6,3032	5,0461	0,1994	0,1795	7
2	0,4842	4,1434		3,6652	0,4185	0,1884	14
3	0,6118	2,2062		2,2062	0,6499	0,1951	21
4	0,4215	0,9894		0,5689	0,9097	0,2048	28
5	0,5360	1,1094		0,5689	0,9097	0,1638	35

Lampiran 9. Persentase kehilangan massa poliuretan yang disintesis dari PEG, Pati Amilium, dan MDI dengan pemendaman.

No	Berat Kertas (g)	Berat PU +Kertas (g)	Massa PU (Awal) (g)	Massa PU (akhir) (g)	Kehilangan Massa (%) (g)	Degradi bilitas g/hari	Lama Inkubasi (Hari)
1	0,4492	7,2549	6,8957	5,5186	0,1891	0,1843	7
2	0,5016	4,6456		4,1440	0,3911	0,1901	14
3	0,4581	3,0600		2,6019	0,6176	0,2001	21
4	0,5203	1,5219		1,0016	0,7059	0,1715	28
5	0,5112	1,5128		1,0016	0,7059	0,1372	35

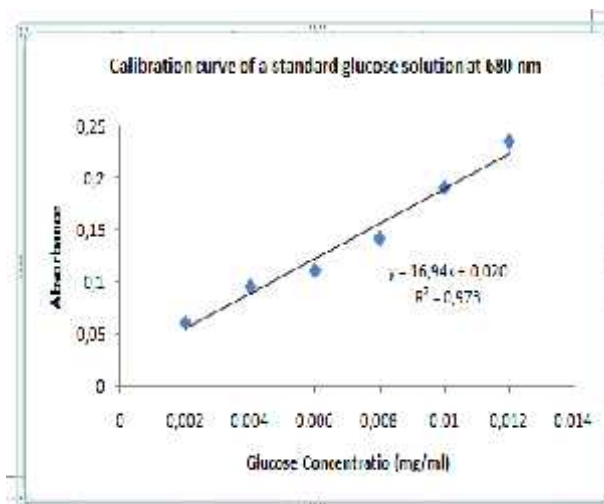


Lampiran 10. Uji karbohidrat dengan pereaksi Molish



Lampiran 11. Kurva standar glukosa dengan metode Nelson Samoghi pada $\lambda = 680 \text{ nm}$.

konsentrasi glukosa (mg/ml)	absorban
0.002	0.061
0.004	0.096
0.006	0.111
0.008	0.142
0.01	0.191
0.012	0.235



Lampiran 12. Kadar glukosa sampel uji dengan metode Nelson Somoghy

No	Kode Sampel	Absorban	Glukosa Terukur (mg/ mL)	Volume Ekstrak Pati (mL)	Jumlah Glukosa Dalam Ekstrak (mg)	Berat Sampel Awal (mg)	Kadar Glukosa (%)
1	40 NM	0,277	0,0152	100	1,5171	1000,0	0,1517
2	60 NM	0,235	0,0127	100	1,2692	1000,0	0,1269
3	80 NM	0,230	0,0124	100	1,2397	1000,0	0,1240
4	100 NM	0,340	0,0189	100	1,8890	1000,0	0,1889

Lampiran 13. Kristanilitas Pati BPK

No	Peak Fraksi kristal	Peak Fraksi amorf
1	2800	7200
2	2500	4200
3	1900	3500
4	-	2800
5	-	2000
6	Total=7200	Total=12.500

Rumus Persaman Cullity:

$$\text{Kristalinitas} = \frac{\frac{F}{K} + \frac{K}{a}}{\frac{7}{7} + 1.5} \times 100\% \text{ kristal}$$

$$= \frac{7}{7 + 1.5} \times 100\% \text{ atau } \frac{7}{1.7} \times 100\%$$

$$= 36,54\%$$

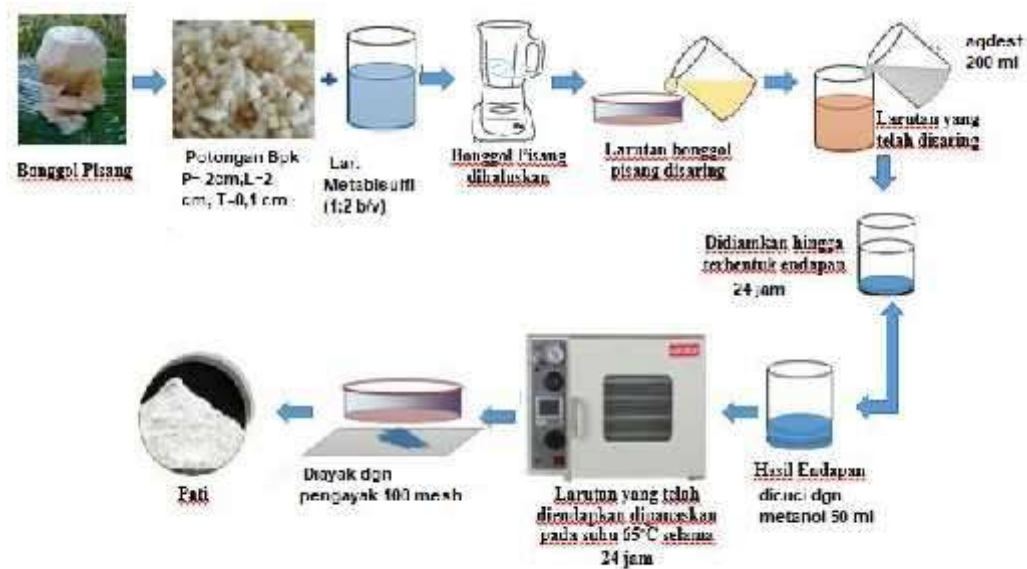
Fraksi kristal+ Fraksi amorf= 100%

Fraksi amorf : 100%- Fraksi Kristal

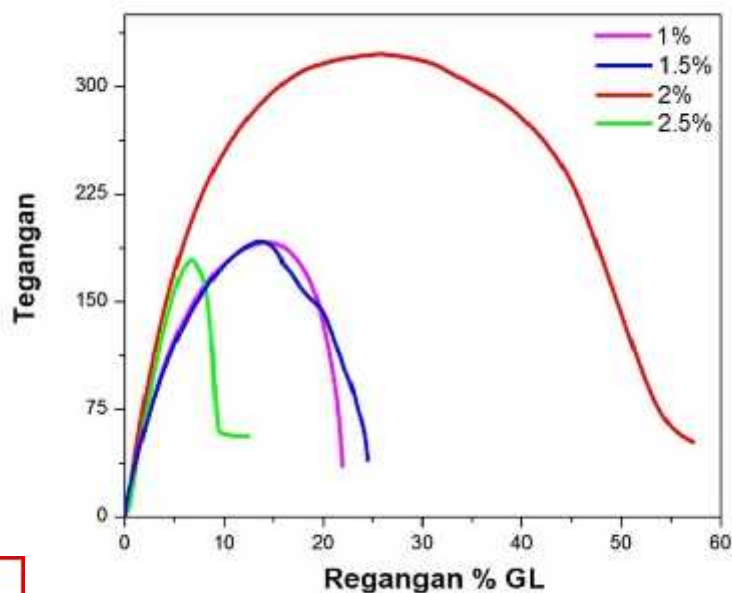
$$: 100\%-36,54\%= 63,46\%$$



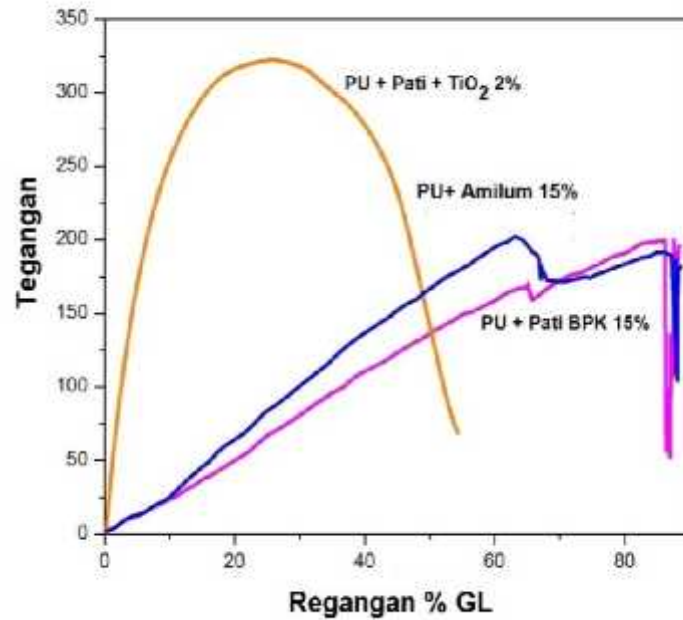
Lampiran 14. Isolasi Pati dari Bonggol pisang Kepok



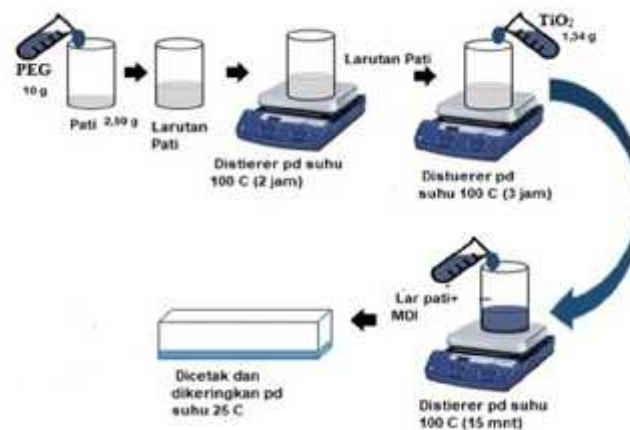
Lampiran 15. Kurva tegangan vs regangan PU yang disintesis dari bahan PEG 400, MDI, Pati BPK 15% dan TiO₂ dengan konsentrasi (1%,1,5%,2% dan 2,5%)



Lampiran 16. Kurva tegangan vs regangan PU yang berasal dari dari PU-Pati BPK 15%, PU- Amilum 15% dan PU-Pati BPK 15%-TiO₂ 2%



Lampiran 17. Sintesis poliuretan dari PEG 400, Pati BPK, TiO₂ dan MDI



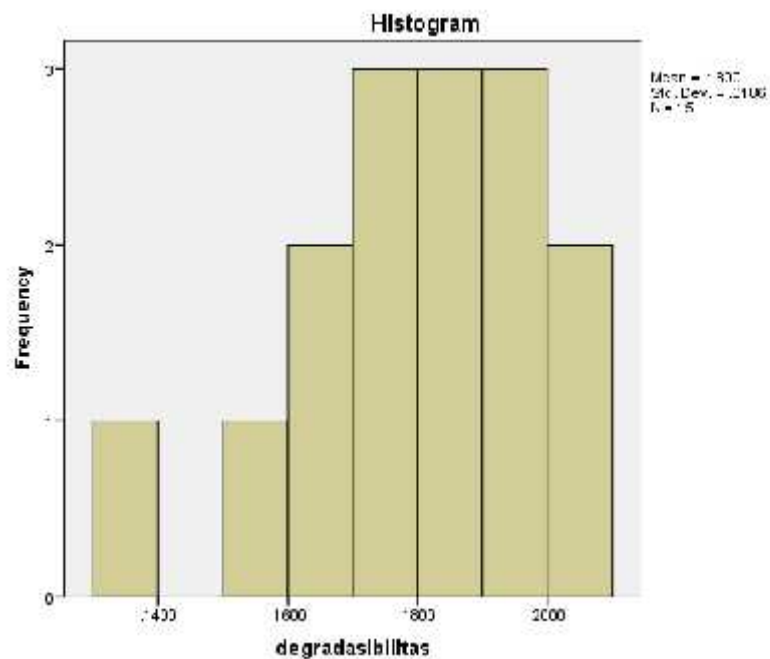
Lampiran 18. Degradasi PU

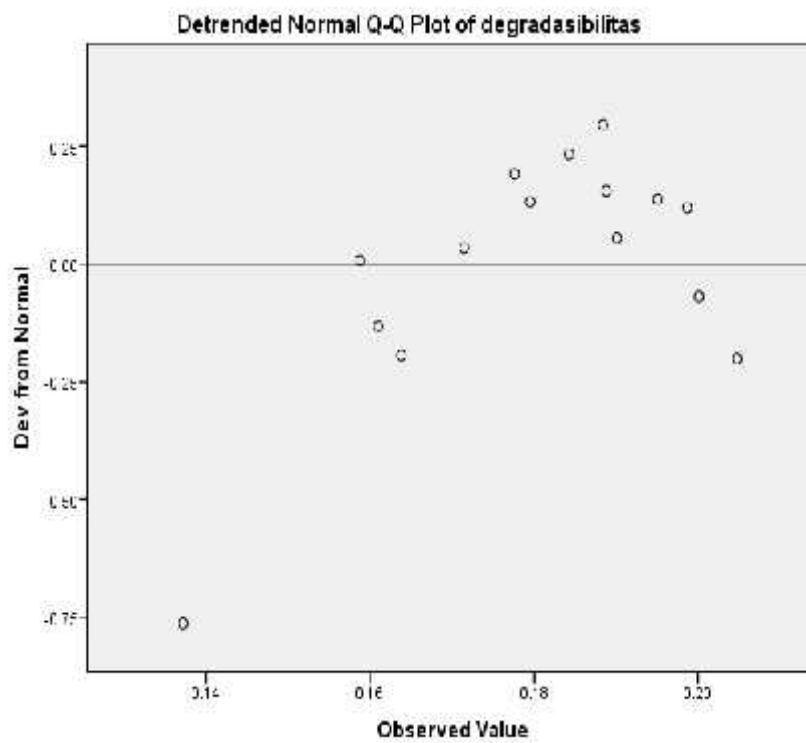
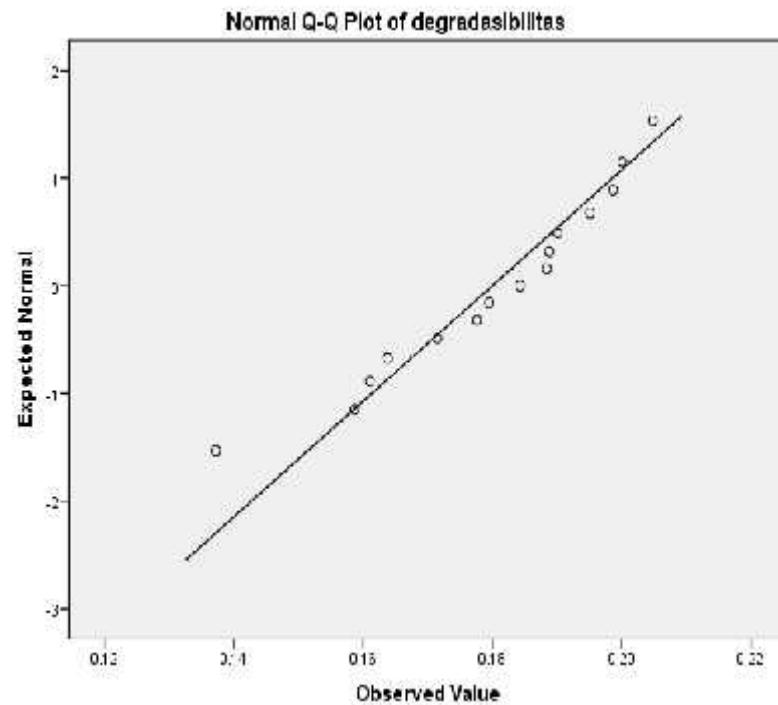


Lampiran 19 . Uji signifikansi PU dengan metode Anova

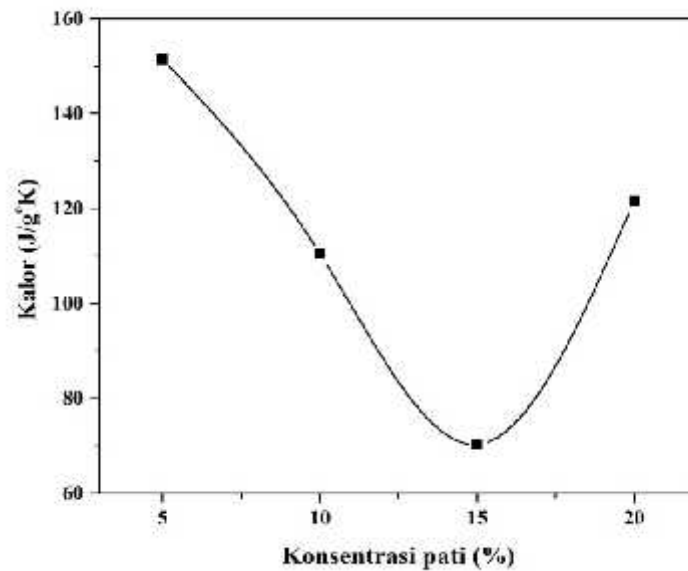
Test Normal

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistik	df	Sig.	Statistik	df	Sig.
Degradabilitas	.141	15	.200*	.944	15	.432

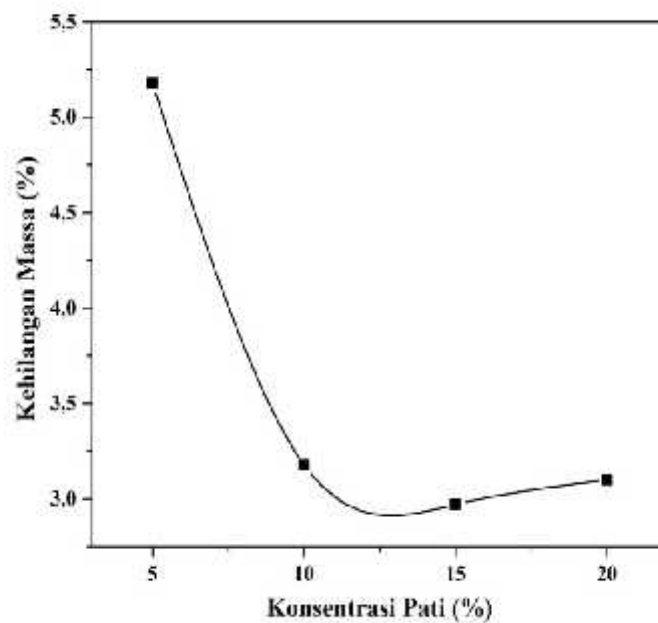


Lampiran 20. Uji signifikansi PU dengan metode Anova

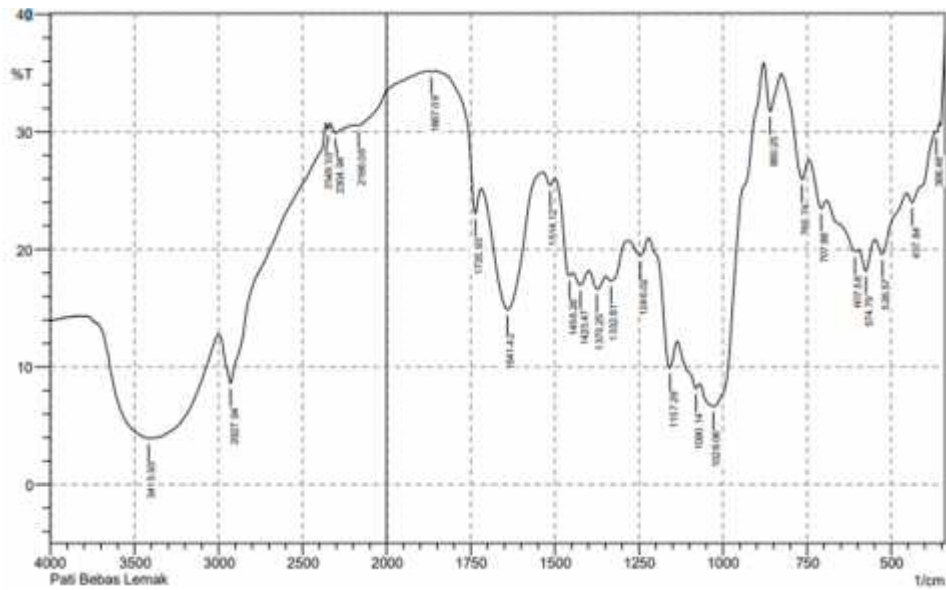
Lampiran 21. Kurva Hubungan konsentrasi pati terhadap jumlah kalor yang dilepaskan dalam sintesis PU dari PEG 400, MDI dan pati BPK



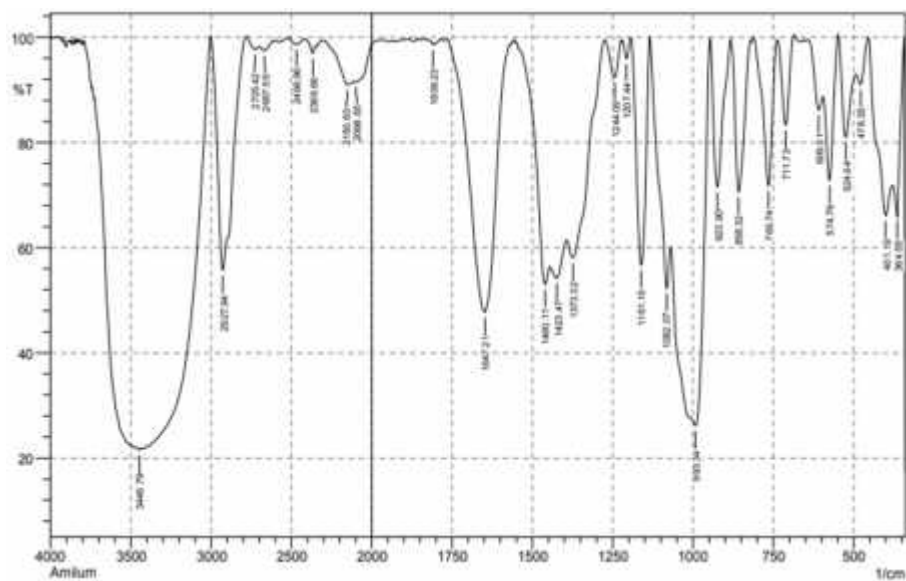
Lampiran 22. Kurva hubungan konsentrasi pati terhadap kehilangan massa PU yang di sintesis PU dari PEG 400, MDI dan Pati BPK



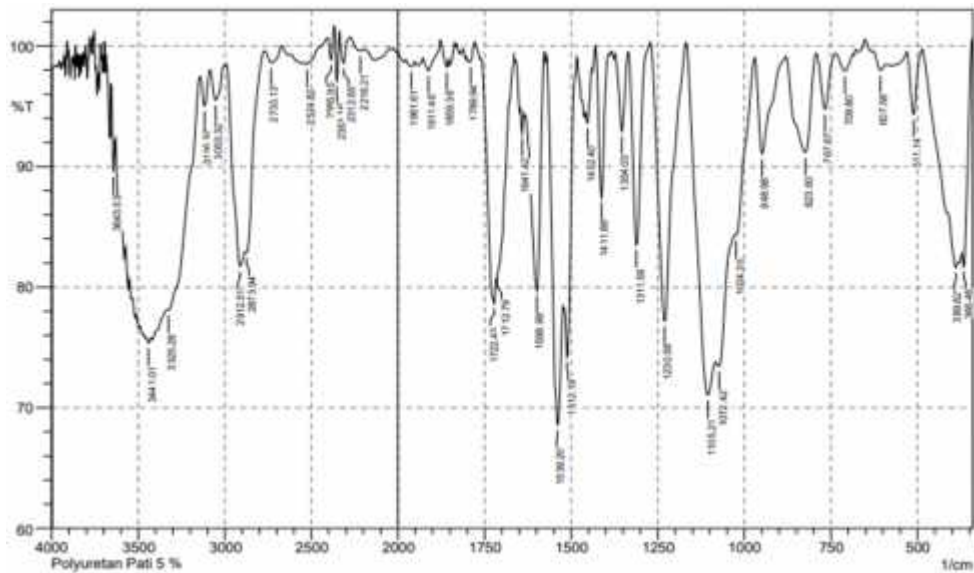
Lampiran 23. Hasil uji gugus fungsi Pati BPK dengan FTIR.



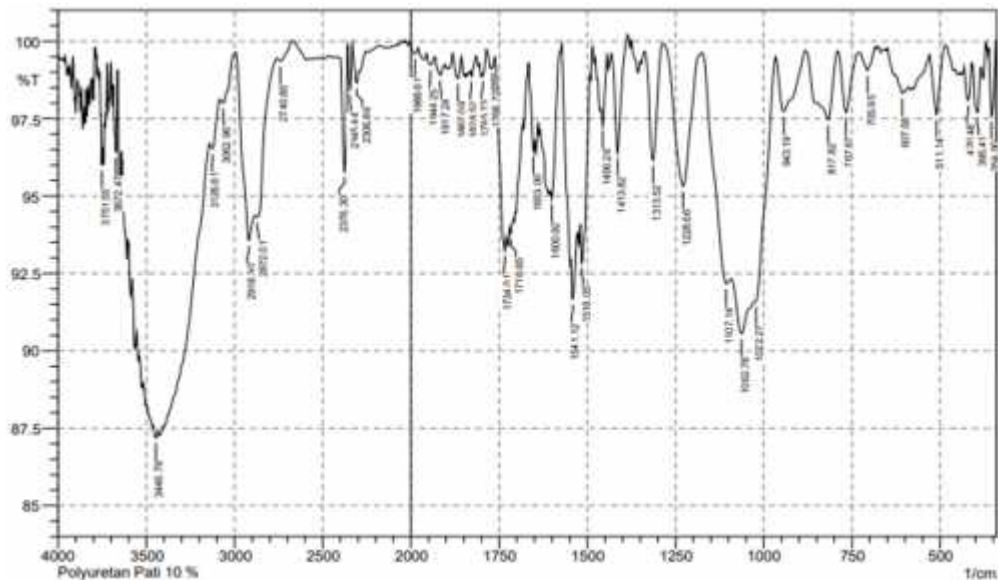
Lampiran 24. Hasil uji gugus fungsi Amilum dengan FTIR



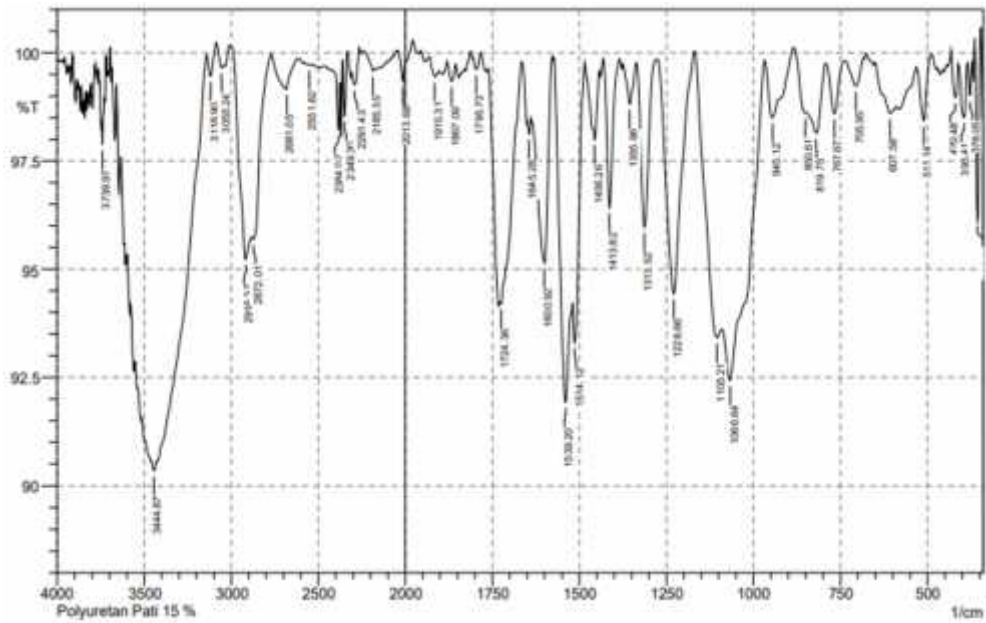
Lampiran 25. Data Optimalisasi uji gugus fungsi PU-Pati BPK 5% melalui FTIR



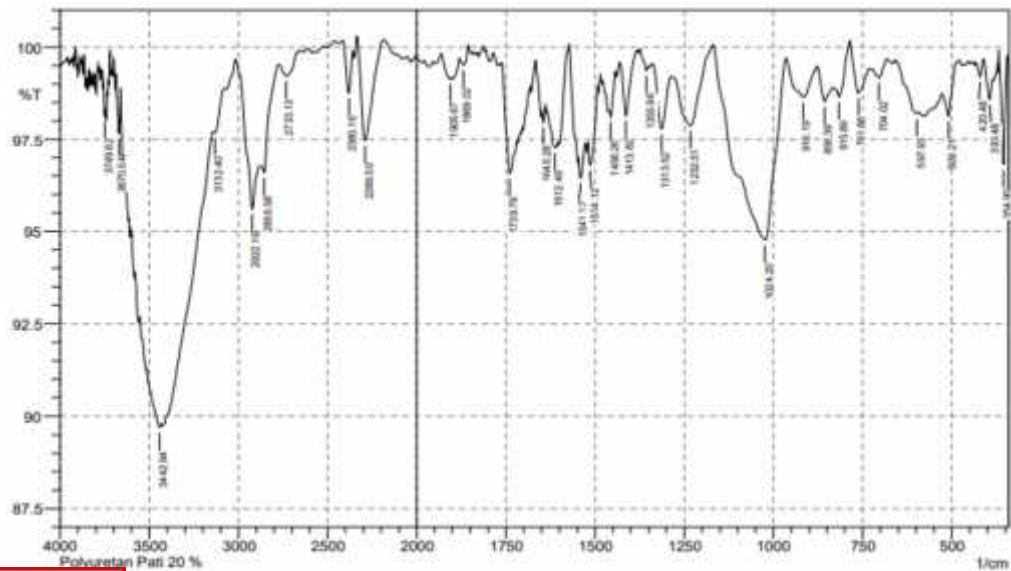
Lampiran 26. Data Optimalisasi uji gugus fungsi PU-Pati BPK 10% melalui FTIR



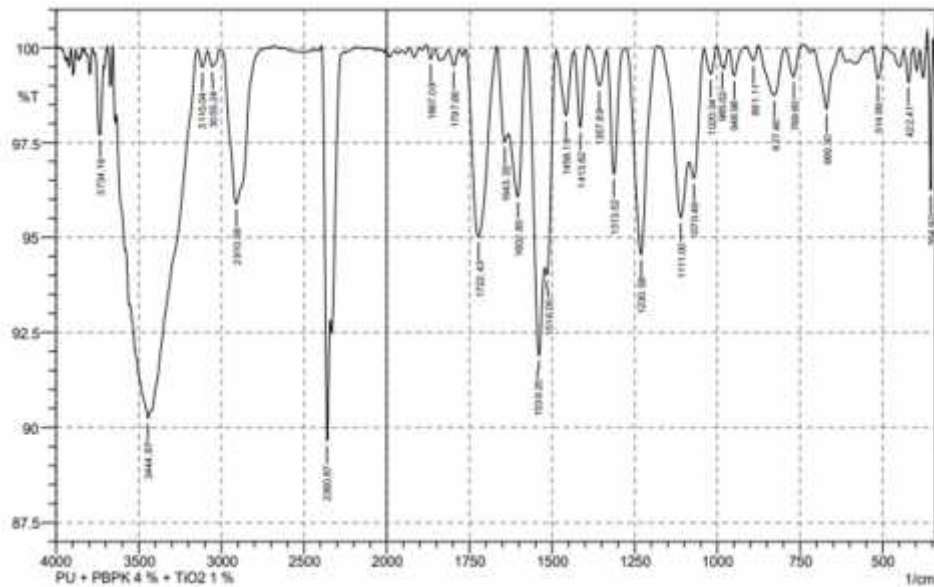
Lampiran 27. Data Optimalisasi uji gugus fungsi PU-Pati BPK 15% melalui FTIR.



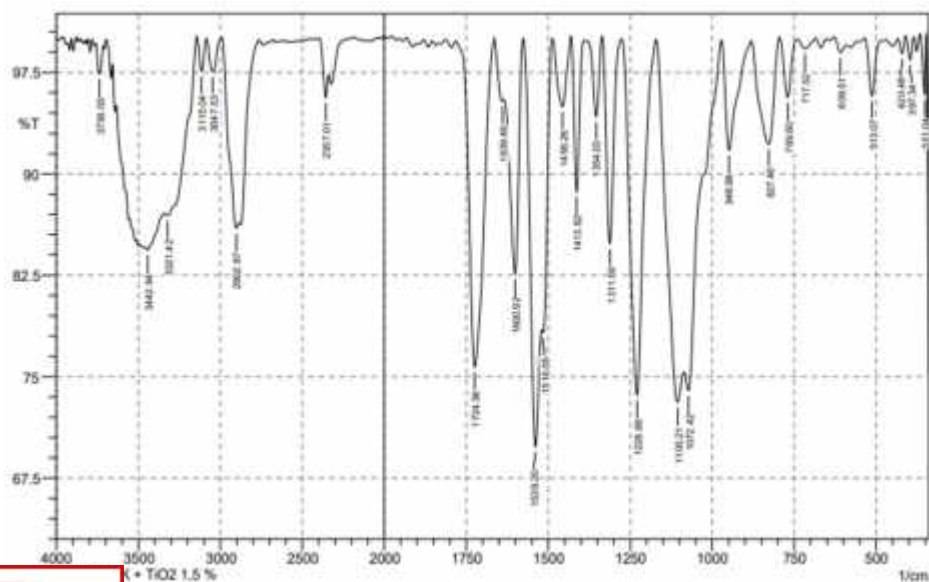
Lampiran 28. Data Optimalisasi uji gugus fungsi PU-Pati BPK 20% melalui FTIR.



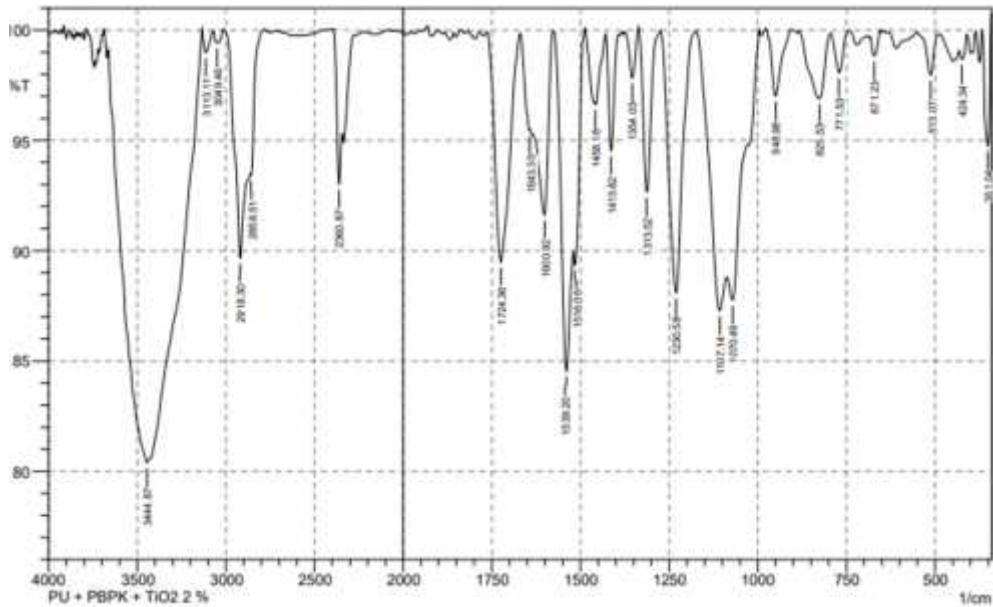
Lampiran 29. Data optimalisasi uji gugus fungsi PU -Pati BPK -TiO₂ 1% melalui pengujian FTIR.



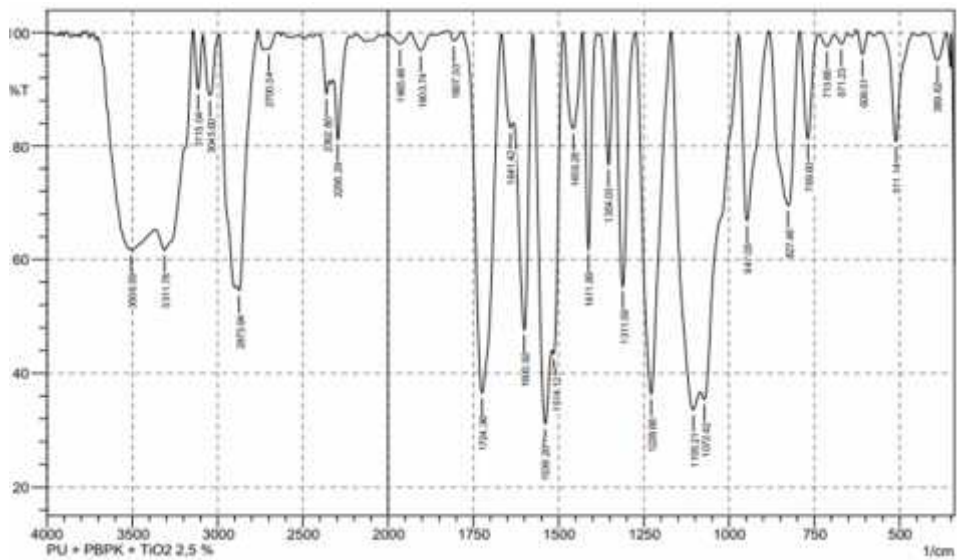
Lampiran 30. Data optimalisasi uji gugus fungsi PU -Pati BPK -TiO₂ 1,5% melalui pengujian FTIR



Lampiran 31. Data optimalisasi uji gugus fungsi PU -Pati BPK -TiO₂ 2,0% melalui pengujian FTIR.



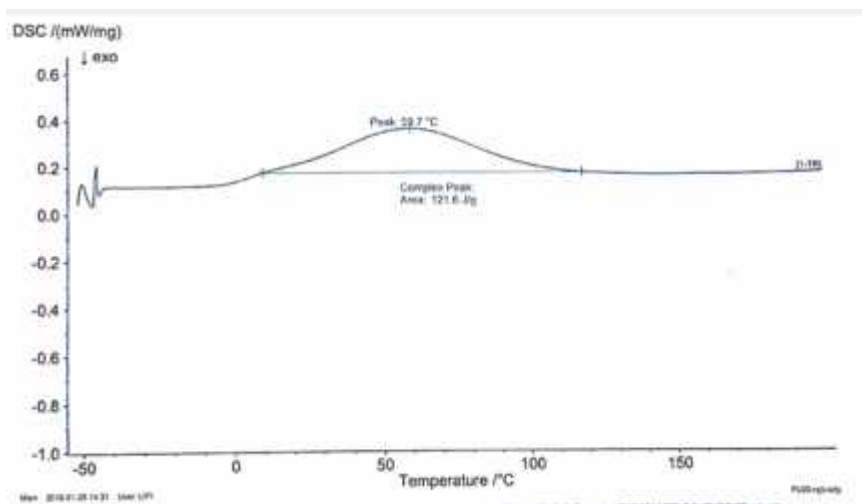
Lampiran 32. Data optimalisasi uji gugus fungsi PU -Pati BPK-TiO₂ 2,5% melalui pengujian FTIR.



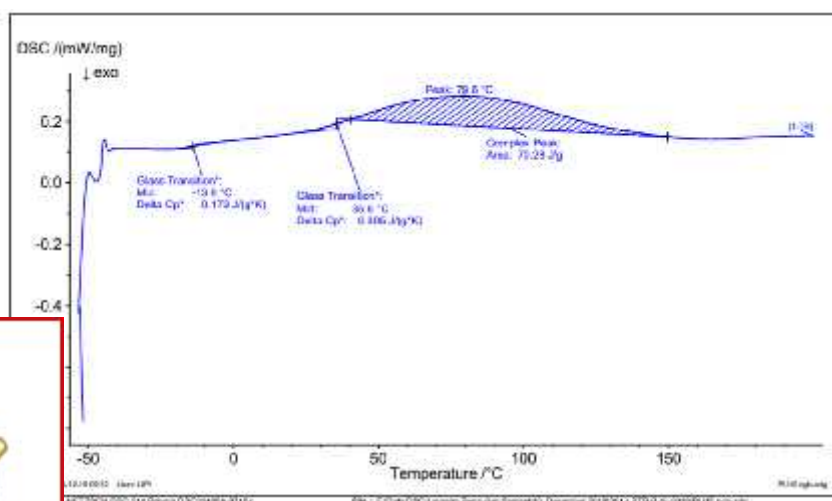
Lampiran 33. Data optimalisasi uji sifat termal PU-Pati BPK dengan TGA
(*Thermogravimetry Analysis*)

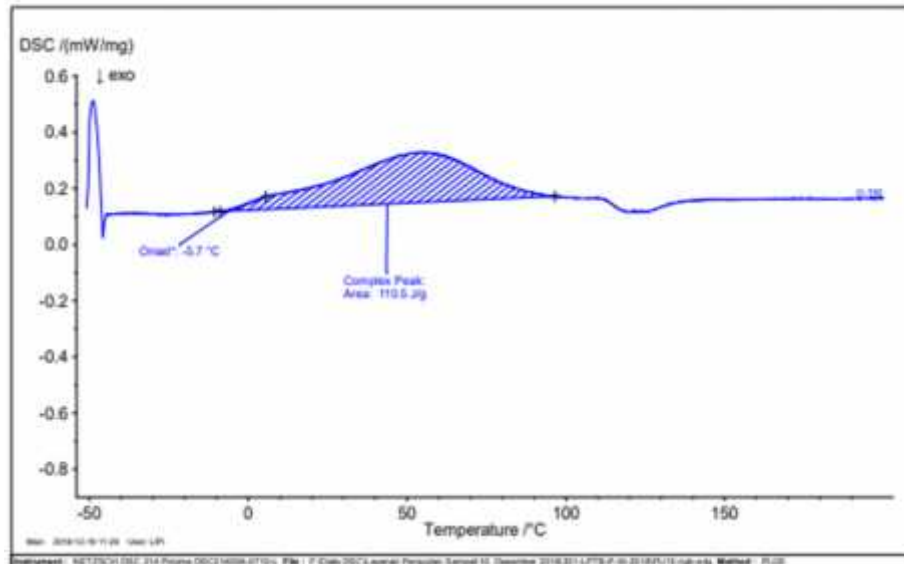
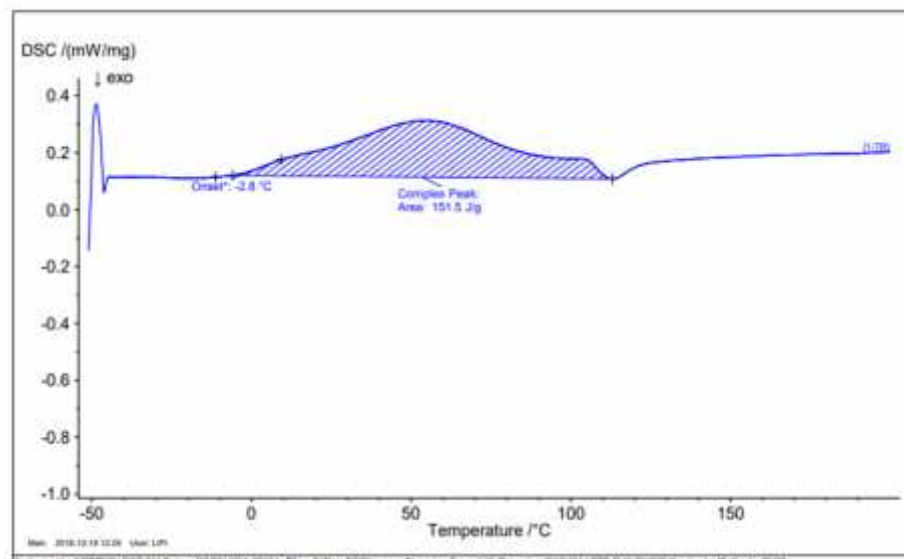
No	Jenis polimer	Persentase (%) penurunan massa	Temperatur
1	PU-Pati BPK 20%	2,72	150-200°C
2	PU-Pati BPK 15%	2,97	200-250°C
3	PU-Pati BPK10%	3,18	200-250°C
4	PU-Pati BPK 5%	5,01	200-250°C

Lampiran 34. Uji sifat termal PU -Pati BPK 20% dengan DSC

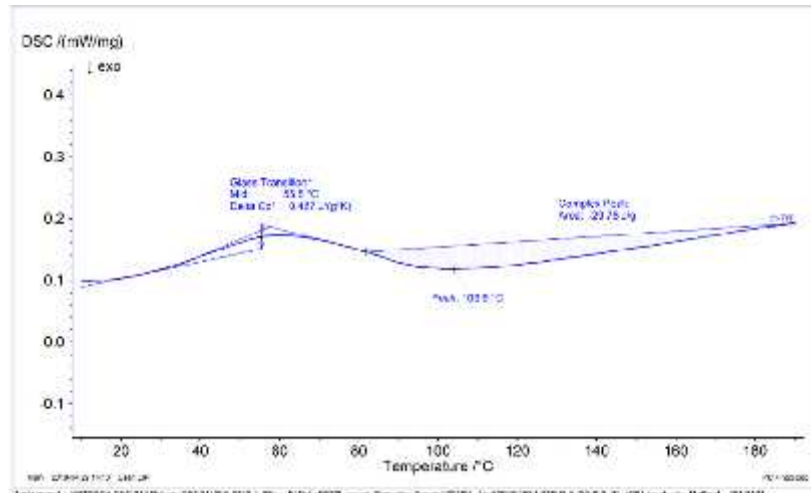


Lampiran 35. Uji sifat termal PU -Pati BPK 15% dengan DSC

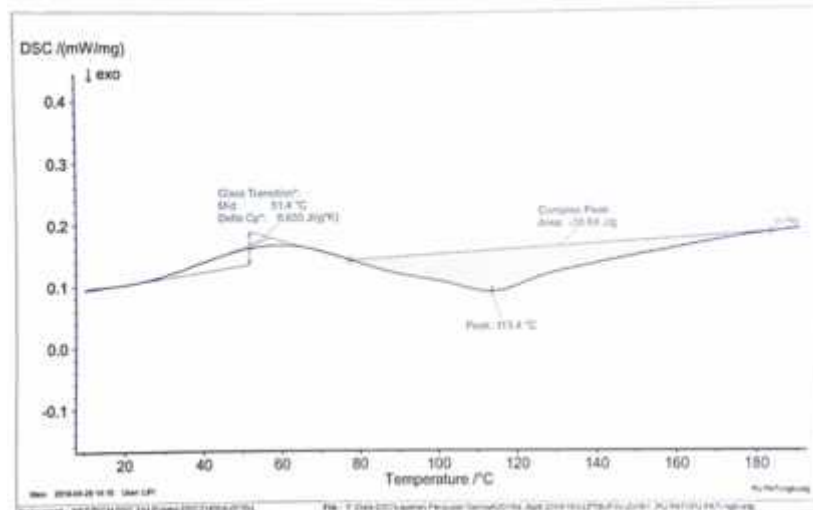


Lampiran 36. Uji sifat termal PU -Pati BPK 10% dengan DSC**Lampiran 37.** Uji sifat termal PU-Pati BPK 5,0% dengan DSC

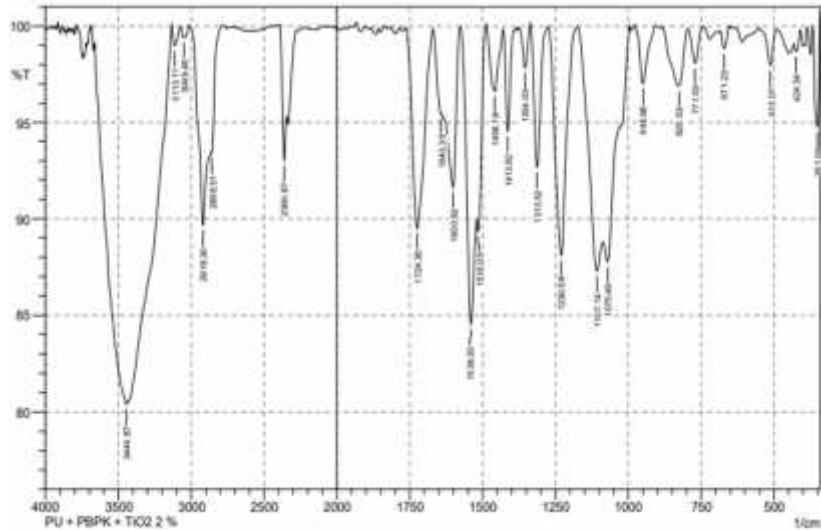
Lampiran 38. Uji sifat termal PU (PEG 400-MDI) dengan DSC (*Differential Scanning Calorimetry*)



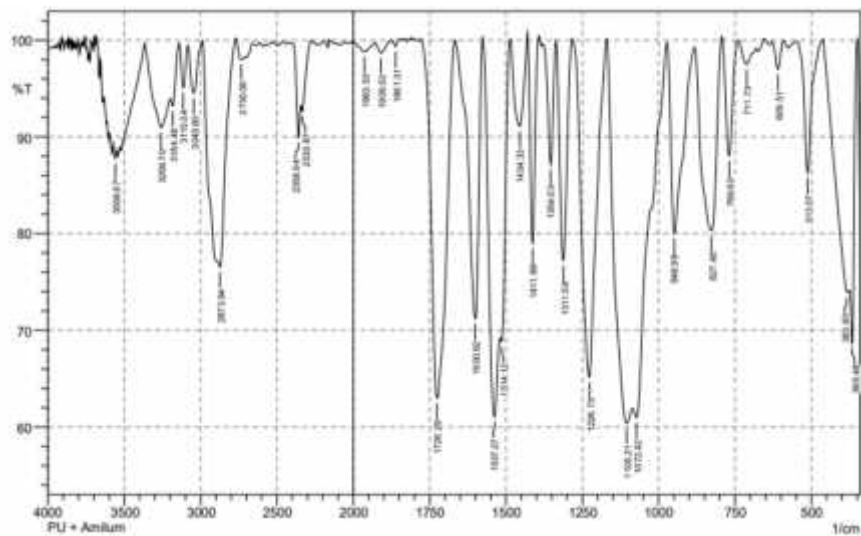
Lampiran 39. Uji sifat termal PU-Pati BPK dengan DSC (*Differential Scanning Calorimetry*)



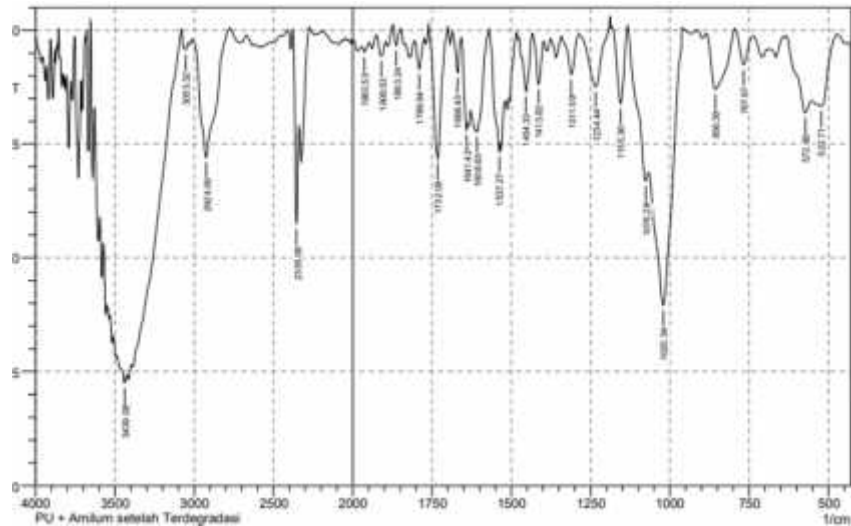
LAMPIRAN 42. Uji gugus fungsi PU-Pati BPK 15%-TiO₂ 2% sebelum degradasi dengan FTIR



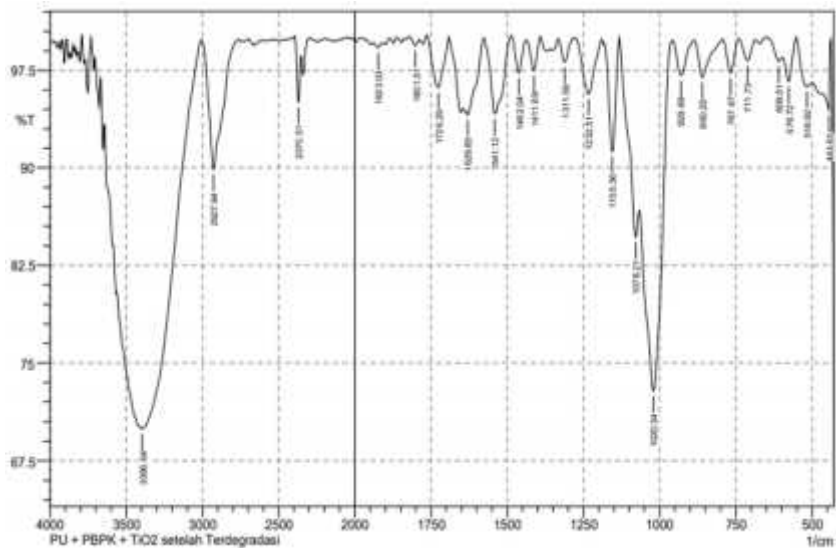
Lampiran 43. Uji gugus fungsi PU-Amilum sebelum degradasi FTIR



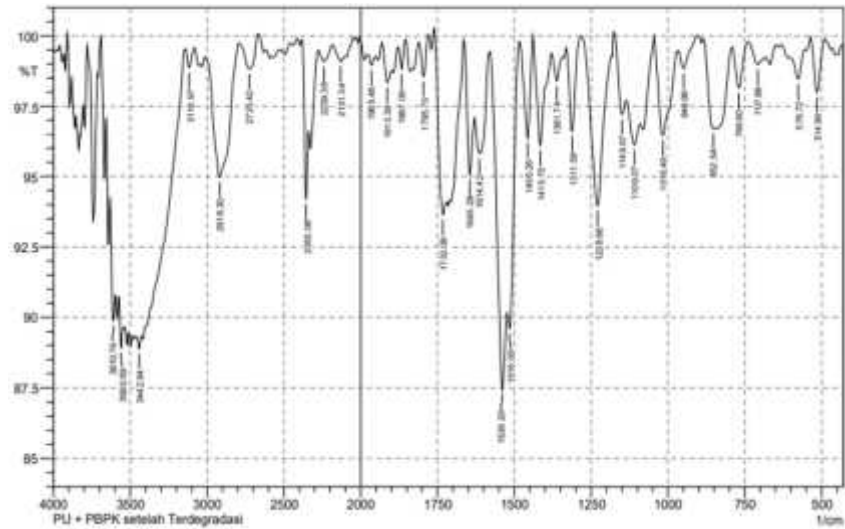
Lampiran 44. Uji gugus fungsi PU Amilum sesudah degradasi FTIR



Lampiran 45. Uji gugus fungsi PU-Pati BPK 15%-TiO₂ 2% sesudah degradasi FTIR



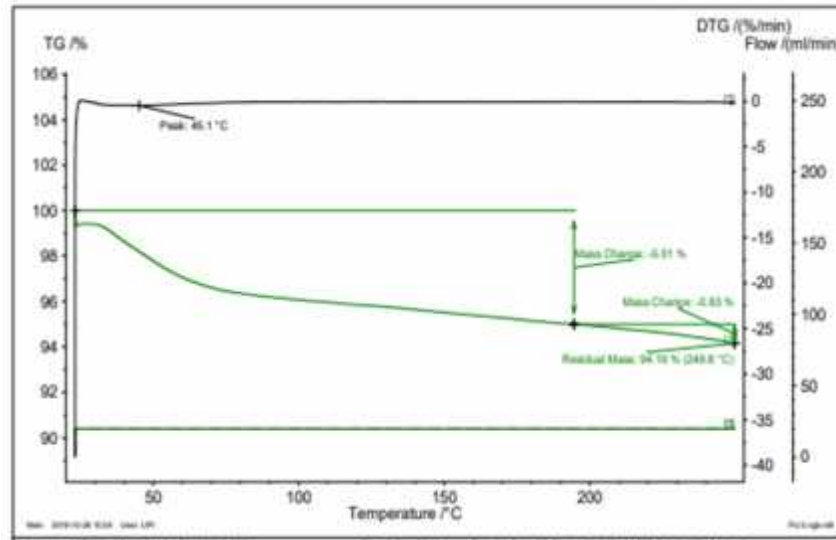
Lampiran 46. Uji gugus fungsi PU-Pati BPK 15% sesudah degradasi FTIR



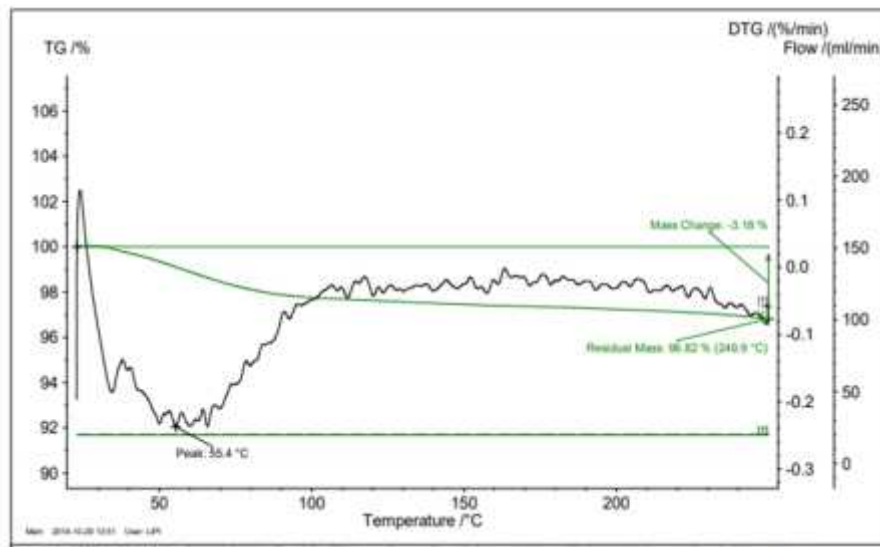
Lampiran 47. Gambar Produk PU dari PU-Pati BPK



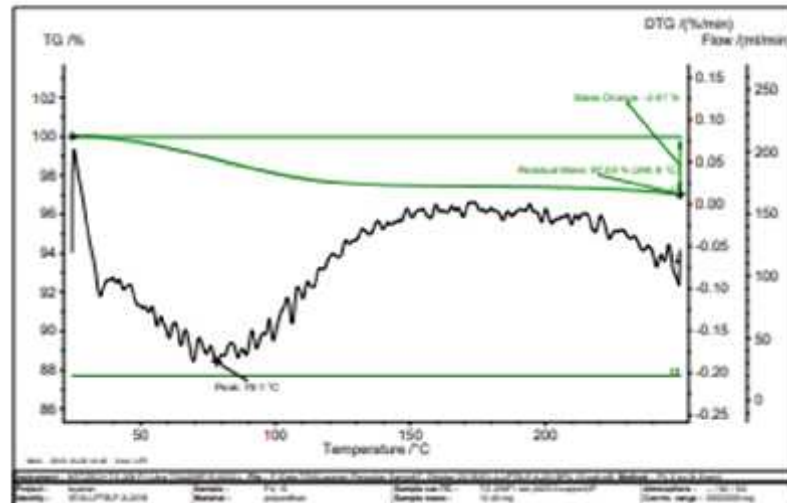
Lampiran 48. Termogram PEG 400, MDI, MDI dan Pati BPK dengan konsentrasi 5 % melalui TGA-DTG



Lampiran 49. Termogram PEG 400, MDI, MDI dan Pati BPK dengan konsentrasi 10 % melalui TGA-DTG



Lampiran 50. Termogram PEG 400, MDI, MDI dan Pati BPK dengan konsentrasi 15 % melalui TGA-DTG



Lampiran 51. Termogram PEG 400, MDI, MDI dan Pati BPK dengan konsentrasi 20 % melalui TGA-DTG

