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International Journal of Precision Engineering and Manufacturing - Green Technology
Volume 7, Issue 1, 1 January 2020, Pages 163-172

Alumina Recovery from Industrial Waste : Study on the Thermal , Tensile and Wear Properties of Polypropylene / Alumina Nanocomposites (Article)

Sufian, A.S.[a], Samat, N.[b], Sulaiman, M.Y.M.[c], Paulus, W.[c]

[a]School of Materials Engineering, Universiti Malaysia Perlis, Kompleks Pusat Pengajian Jejawi 2, Taman Muhibbah, Jejawi, Arau, Perlis 02600, Malaysia
[b]Department of Manufacturing and Materials Engineering, International Islamic University Malaysia, Jalan Gombak, Gombak, Kuala Lumpur 53100, Malaysia
[c]Material Technology Group, Industrial Technology Group, Malaysian Nuclear Agency, Bangi, Kajang, Selangor 43000, Malaysia

Abstract

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The investigation on the influences of alumina (Al_2O_3) particles in nano-sized retrieved from Aluminium (Al) dross was conducted on the tensile, thermal and wear properties of polypropylene (PP) composites. The thermal decomposition method was used to synthesise the micro α-Al_2O_3 particles from Al-dross, was followed by the wet-milling method to produce the nano α-Al_2O_3. The PP composites (nano and micro α-Al_2O_3 particles) were prepared via melt compounding followed by compression molding. The coupling agent was also added to facilitate the particle dispersion. The tensile tests showed the maximum tensile strength and Young's modulus of both composites to be corresponding to the samples containing 5 wt% of α-Al_2O_3. The superiority of nano α-Al_2O_3 on improving the property of PP had also been evident in the abrasive wear performance. A small amount of α-Al_2O_3 had been adequate in enhancing the thermal stability of PP than that of neat PP. The study on tensile and worn surface with SEM had revealed better adhesion and interaction between the filler and matrix in composites that were treated with coupling agent. The recovery of nano α-Al_2O_3 particles from Al-dross potentially decreases the quantity of harmful solid waste and can be an effective alternative filler for thermoplastics. © 2019, Korean Society for Precision Engineering.

SciVal Topic Prominence

Topic: Mechanical properties | Composite materials | Tensile strength

Prominence percentile: 55.898

Chemistry database information

Substances

Al

aluminium oxide

Related documents

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Abdulkadir, A. , Ajayi, A. , Hassan, M.I.
(2015) Energy Procedia

The compatibility effects of irradiated recycled PP on the mechanical and water properties of recycled PP/microcrystalline cellulose composites
Samat, N. , Yahya, M.S. , Lazim, N.H.M.
(2016) AIP Conference Proceedings

Effects of electron beam radiation dose on the compatibilization behaviour in recycled polypropylene/microcrystalline cellulose composites
Samat, N. , Motsidi, S.N.R. , Lazim, N.H.M.
(2018) IOP Conference Series: Materials Science and Engineering

Author keywords

Alumina nanoparticle | Mechanical property | Reinforcement | Thermal | Waste | Wear

Indexed keywords

Engineering controlled terms: Alumina | Compression molding | Coupling agents | Decomposition | Fillers | Mechanical properties | Polypropylenes | Reinforcement | Tensile strength | Tensile testing | Thermodynamic stability | Wastes | Wear of materials

Engineering uncontrolled terms: Alumina Nanoparticle | Melt-compounding | Particle dispersion | Thermal | Thermal decomposition methods | Wear performance | Wear properties | Wet-milling method

Engineering main heading: Aluminum oxide

Funding details

Funding sponsor	Funding number	Acronym
Integrated Envirotech Sdn Bhd		IESB
International Islamic University Malaysia		IIUM

Funding text

The authors wish to extend their gratitude to all parties that had supported the project especially to International Islamic University Malaysia (IIUM), Materials Technology Group Malaysian Nuclear Agency and Mr. Muhammad Shafizaza Rozali from Syfon System Sdn Bhd.

ISSN: 22886206
Source Type: Journal
Original language: English
DOI: 10.1007/s40684-019-00135-z
Document Type: Article
Publisher: Korean Society for Precision Engineering

References (23)

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1 Manfredi, O., Wuth, W., Bohlinger, I.
Characterizing the physical and chemical properties of aluminum dross
(1997) *JOM*, 49 (11), pp. 48-51. Cited 67 times.
http://www.springer.com/materials/journal/11837
doi: 10.1007/s11837-997-0012-9
View at Publisher

2 Dai, C.
(2012) *Development of Aluminum Dross-Based Material for Engineering Application*. Cited 7 times.
PhD Dissertation, Worcester Polytechnic Institute

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3 Adeosun, S.O., Usman, M.A., Ayoola, W.A., Sekunowo, I.O.
Evaluation of the mechanical properties of polypropylene-aluminum-dross composite
(2012) *ISRN Poly Science*, 2012, pp. 1-7. Cited 7 times.

4 Meor, Y.M.S., Masliana, M., Wilfred, P., Mahdi, E.M., Parimala, D.
Effect of milling time and dispersant on microstructures of alpha alumina nanopowder synthesized from aluminium dross waste

(2012) *Advanced Materials Research*, 364, pp. 372-376. Cited 2 times.
ISBN: 978-303785301-6
doi: 10.4028/www.scientific.net/AMR.364.372

View at Publisher

5 Rajeshkumar, L., Pranab, D.
Extraction of value added product from waste aluminium dross
(2017) *International Journal of Engineering Research in Mechanical and Civil Engineering*, 2 (4), pp. 54-58.

6 Samat, N., Sabaruddin, F.A., Meor Yusoff, M.S., Dayang Habibah, A.I.H.
Evaluation of Waste from Aluminum Industry as Filler in Polypropylene Composites

(2017) *JOM*, 69 (4), pp. 790-795. Cited 2 times.
http://www.springer.com/materials/journal/11837
doi: 10.1007/s11837-016-2232-3

View at Publisher

7 Anis Sofia, S., Samat, N., Meor Yusoff, M.S.
Effect of dispersants on microstructures of nano alpha alumina developed from aluminium dross waste
(2015) *Advanced Materials Research*, 1115, pp. 378-381.

8 Paulus, W., Meor Yusoff, M.S., Muslim, M., Mahmoud, M.E., Mahat, S., Devi, P.
XRD and SEM characterization of different alumina crystalline forms from aluminium white dross waste
(2011) *Proceeding of IMTEC 2010 (Kuching)*

9 Bushra, H.M.
Study of the wear rate of some polymer materials in different conditions
(2010) *Journal of Engineering Technology*, 28 (16), pp. 5165-5170.

10 Mirjalili, F., Chuah, L., Khalid, M., Hasmaliza, M.
Effects of nano α-Al_2O_3 fillers and dispersant on thermal and dynamic mechanical properties of polypropylene/nano α-Al_2O_3 composite

(2012) *Journal of Thermoplastic Composite Materials*, 25 (4), pp. 453-467. Cited 12 times.
doi: 10.1177/0892705711421805

View at Publisher

11 Idumah, C.I., Hassan, A., Affam, A.C.
A review of recent developments in flammability of polymer nanocomposites

(2015) *Reviews in Chemical Engineering*, 31 (2), pp. 149-177. Cited 29 times.
http://www.reference-global.com/loi/revce
doi: 10.1515/revce-2014-0038

View at Publisher

12 Palza, H., Vergara, R., Zapata, P.
Composites of polypropylene melt blended with synthesized silica nanoparticles

(2011) *Composites Science and Technology*, 71 (4), pp. 535-540. Cited 56 times.
doi: 10.1016/j.compscitech.2011.01.002

View at Publisher

13 Samat, N., Marini, C.D., Maritho, M.A., Sabaruddin, F.A.
Tensile and impact properties of polypropylene/microcrystalline cellulose treated with different coupling agents

(2013) *Composite Interfaces*, 20 (7), pp. 497-506. Cited 10 times.
doi: 10.1080/15685543.2013.812767

View at Publisher

14 Mirjalili, F., Chuah, L., Salahi, E.
Mechanical and morphological properties of polypropylene/Nano α -AlComposites
(Open Access)

(2014) *The Scientific World Journal*, 2014, art. no. 718765. Cited 19 times.
doi: 10.1155/2014/718765

View at Publisher

15 Kakde, P., Paul, S.N.
Effect of alumina nanoparticle addition on the mechanical and wear behaviour of reinforced acrylonitrile butadiene styrene polymer
(2014) *International Journal of Advanced Research in Science, Engineering and Technology*, 5 (6), pp. 185-192. Cited 4 times.

16 Izzati Zulkifli, N., Samat, N., Anuar, H., Zainuddin, N.
Mechanical properties and failure modes of recycled polypropylene/microcrystalline cellulose composites

(2015) *Materials and Design*, 69, pp. 114-123. Cited 48 times.
doi: 10.1016/j.matdes.2014.12.053

View at Publisher

17 Pérez, E., Alvarez, V., Pérez, C.J., Bernal, C.
A comparative study of the effect of different rigid fillers on the fracture and failure behavior of polypropylene based composites

(2013) *Composites Part B: Engineering*, 52, pp. 72-83. Cited 28 times.
doi: 10.1016/j.compositesb.2013.03.035

View at Publisher

18 Hamdan, M.H.M., Siregar, J.P., Rejab, M.R.M., Bachtiar, D., Jamiluddin, J., Tezara, C.

Effect of Maleated Anhydride on Mechanical Properties of Rice Husk Filler Reinforced PLA Matrix Polymer Composite

(2019) *International Journal of Precision Engineering and Manufacturing - Green Technology*, 6 (1), pp. 113-124. Cited 5 times.
http://www.springer.com/engineering/production+engineering/journal/40684
doi: 10.1007/s40684-019-00017-4

View at Publisher

19 Zhao, S., Schadler, L.S., Duncan, R., Hillborg, H., Auletta, T.

Mechanisms leading to improved mechanical performance in nanoscale alumina filled epoxy

(2008) *Composites Science and Technology*, 68 (14), pp. 2965-2975. Cited 148 times.
doi: 10.1016/j.compscitech.2008.01.009

View at Publisher

20 Chaitanya, S., Singh, I.

Ecofriendly treatment of aloe vera fibers for PLA based green composites

(2018) *International Journal of Precision Engineering and Manufacturing - Green Technology*, 5 (1), pp. 143-150. Cited 5 times.
http://www.springer.com/engineering/production+engineering/journal/40684
doi: 10.1007/s40684-018-0015-8

View at Publisher

21 Sohn, J.S., Cha, S.W.

Enhanced interfacial adhesion of polypropylene and waste wood from roadside trees composite materials

(2015) *International Journal of Precision Engineering and Manufacturing*, 16 (11), pp. 2389-2393. Cited 5 times.
http://www.springerlink.com/content/2234-7593/
doi: 10.1007/s12541-015-0308-6

View at Publisher

22 Piconi, C.

Alumina

(2011) *Comprehensive Biomaterials*, 1, pp. 73-94. Cited 12 times.
http://www.sciencedirect.com/science/referenceworks/9780080552941
ISBN: 978-008055294-1

23 McElwain, S.E., Blanchet, T.A., Schadler, L.S., Sawyer, W.G.

Effect of particle size on the wear resistance of alumina-filled PTFE micro- and nanocomposites

(2008) *Tribology Transactions*, 51 (3), pp. 247-253. Cited 94 times.
doi: 10.1080/10402000701730494

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Samat, N.; Department of Manufacturing and Materials Engineering, International Islamic University Malaysia, Jalan Gombak, Gombak, Kuala Lumpur, Malaysia; email:noorasikin@iium.edu.my