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

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### Abstract

The investigation on the influences of alumina (Al<sub>2</sub>O<sub>3</sub>) 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 alpha-Al<sub>2</sub>O<sub>3</sub> particles from Al-dross, was followed by the wet-milling method to produce the nano alpha-Al<sub>2</sub>O<sub>3</sub>. The PP composites (nano and micro alpha-Al<sub>2</sub>O<sub>3</sub> 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 alpha-Al<sub>2</sub>O<sub>3</sub>. The superiority of nano alpha-Al<sub>2</sub>O<sub>3</sub> on improving the property of PP had also been evident in the abrasive wear performance. A small amount of alpha-Al<sub>2</sub>O<sub>3</sub> 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 alpha-Al<sub>2</sub>O<sub>3</sub> particles from Al-dross potentially decreases the quantity of harmful solid waste and can be an effective alternative filler for thermoplastics.

### Keywords

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