

# Chemical Engineering: From Materials Engineering to Nanotechnology

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## Fabrication of $ZrO_2$ nanofiller from polystyrene polymer waste as reinforcement

Olusola Olaitan Ayeleru<sup>1</sup>, Freeman Ntuli<sup>1</sup>, Williams Kehinde Kupolati<sup>2</sup> and Peter Apata Olubambi<sup>1</sup>

<sup>1</sup> University of Johannesburg, South Africa

<sup>2</sup> Tshwane University of Technology, South Africa

Rapid generation of non-biodegradable polymer wastes (NBPW) has posed serious environmental and economic challenges which are now issues of global concern. This study explored the application of nanofiller material from polystyrene polymer waste (PPW) through upcycling recycling process method of the waste material and its incorporation as reinforcement materials in road construction. The PPW sample from a recycling facility in Johannesburg was thermally treated to upcycle the wastes. The PPW sample was dispersed in an organic solvent,  $Zr(NO_3)_4$  and was

heated. A corresponding control experiment was carried out in the absence of  $Zr(NO_3)_4$ . Afterwards,  $ZrO_2$  nanofiller was obtained from the resulting product of the first experiment and another product was obtained from the control experiment and both were characterized by SEM, EDX, TEM, FTIR, BET, XRD and TGA. This work demonstrated an alternative route of upcycling NBPW in a cost-effective and environmentally friendly ways.

e: olusolaolt@gmail.com