



Mechanical properties of calcium carbonate/eggshell particle filled polypropylene Composites

Kabiru Mustapha^{1*}, Rashidat Ayinla¹, Abdulraman Sikiru Ottan¹ and Tunji Adetayo Owoseni²

¹ Department of Materials Science and Engineering, Kwara State University, Malete, Nigeria.

² Department of Mechanical, Materials and Manufacturing Engineering, Faculty of Engineering, University of Nottingham, United Kingdom.

ABSTRACT

Calcium carbonate is widely used as a filler material in the production of polymer matrix composites and studies have shown that eggshell contains about 94% calcium carbonate. The effect of calcium carbonate from eggshell particles in polypropylene was studied in this work and the result compared with unreinforced polypropylene. Industrially synthesized calcium carbonate/eggshell particles were used as filler in polypropylene matrix with varying mass fractions from 5 to 20 wt. % at 5 wt. % increment. The produced samples were mechanically characterized for indentation hardness and uniaxial tensile properties using a Rockwell hardness tester and universal mechanical testing machine respectively. These properties were measured at different compositions to determine its compositional dependence. Microstructural analysis of the composites top and fracture surface was also carried out using scanning electron microscope to examine possible failure mode. The results were compared to measure the effect of reinforcement and the replacement criteria for the conventional calcium carbonate. The results obtained showed that calcium carbonate reinforced polypropylene has its highest tensile strength, elastic modulus and modulus of rupture at 5 wt. %, ductility and modulus of resilience at 10 wt. %, and hardness at 15 wt. %. The results also showed that granulated eggshell can provided appreciable improvement in the mechanical properties of polypropylene as obtainable in mineral calcium carbonate reinforced polypropylene.

*Corresponding Author: Email : kabiru.mustapha@kwasu.edu.ng, Mobile: +2348065665369