

PROPERTIES OF POLYAMIDE 6.6 COMPOSITES CONTAINING RECYCLED GLASS PARTICLES

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Glass powder from glass cullet has never been studied as a polyamide reinforcement. In this paper, PA-6.6 composites, reinforced with 10 wt.% of recycled, irregularly shaped, glass powder, and other common industrial fillers (glass fibers and microspheres, talc, and wollastonite), were processed in a double-screw extruder. Specimens were obtained by injection molding, and the following composite properties were measured: tensile strength, elastic modulus, elongation at rupture, and notchless Charpy impact strength.

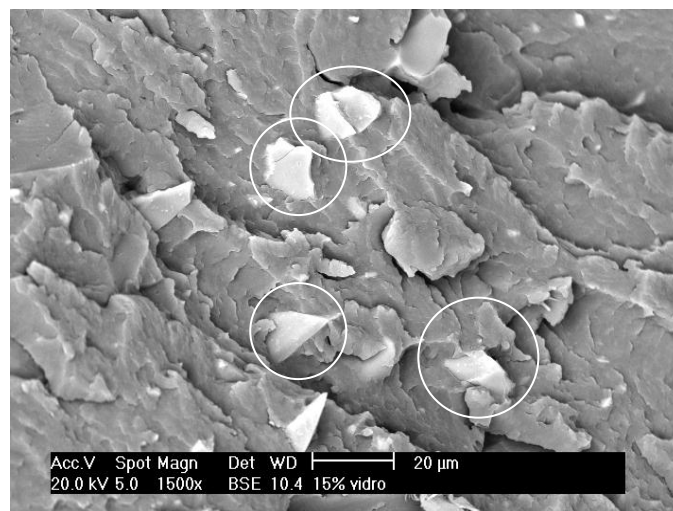


Figure 1: SEM micrograph (backscattered electrons detector) of a fracture surface of the composite containing glass particles. The circles identify some of the glass powder particles (note their assymetry and different contrast).

The glass powder was added to the matrix and processed, without the addition of any additives, either to alter the processing characteristics of the PA-6.6, or to increase the compatibility of the glass powder particles with the polymer matrix. Moreover, the recycled glass powder was particle

size separated in standardized laboratory sieves, so that only the material containing particles less than 60 μm were used in the study. Since glass is a brittle material, the particle size distribution of the powder is very wide, even reaching submicrometer sizes, in its small end. The limit size of 60 μm was chosen because that is a typical (industrial) glass sphere size used as a filler (in general, with a very narrow particle size distribution). Table 1 summarizes the results.

Table 1: Measured mechanical properties of the PA-6.6 composites.

<i>Filler</i>	<i>Elongation at Rupture (%)</i>	<i>Tensile Strength (MPa)</i>	<i>Elastic Modulus (MPa)</i>	<i>Impact Strength (KJ/m²)</i>
No filler	5,3 \pm 0,8	89 \pm 1	3250 \pm 69	208 \pm 163
Talc	8,5 \pm 2,1	77 \pm 1	4140 \pm 201	75 \pm 4
Glass Fiber	2,4 \pm 0,1	77 \pm 1	4936 \pm 175	29 \pm 1
Glass Microspheres	3,0 \pm 0,3	74 \pm 2	3334 \pm 74	20 \pm 1
Wollastonite	12,2 \pm 3,6	81 \pm 1	4039 \pm 106	89 \pm 13
Glass Powder	4,8 \pm 1,0	78 \pm 1	3676 \pm 100	33 \pm 13
<i>Standard</i>	<i>ASTM D638-97</i>	<i>ASTM D638-97</i>	<i>ASTM D638-97</i>	<i>ISO 179-93</i>

The results indicate that it is possible to use particles of recycled glass with no surface modification in a PA-6.6 matrix, once the final composite properties are compatible to the ones of composites containing usual commercial fillers, particularly glass microspheres

References

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