

Experimental analysis tapioca starch reinforced alumina nanoparticle (Al₂O₃) composite

ABSTRACT

The starch-alumina nanoparticle composite components combined together whereas tapioca starch as a matrix and alumina nanoparticle (Al₂O₃) as filler. By increasing the weight percentage of alumina nanoparticle (Al₂O₃) into starch composite, the tensile strength of the composite to frack increase linearly with the increasing of the alumina nanoparticle (Al₂O₃). The exact reason for this variation can be attributed to the fact that alumina particles play like stress concentrators, and this role is promoted as particles lead to be agglomerated. An agglomeration of filler particles plays an important role in creation of stress concentration that effect the composite cracks. The brittle result from the graph applied and the displacement (elongation) before frack decreasing with the increasing alumina nanoparticle (Al₂O₃). Lateral gage middle, angled gage middle, lateral at grip/tab top are tensile type failure codes/typical modes. Scanning Electron Microscopy showed good adhesion between tapioca starch and alumina nanoparticle (Al₂O₃). The adhesion properties between tapioca starch and alumina nanoparticle (Al₂O₃) strong relate to the effects of increasing tensile strength and decreasing in elongation. Three different cracks regions including a flat featureless mirror zone surrounding the crack initiation point, a transition zone, in which the surface roughness steadily increases, and a final propagation zone with conical marks.

Keyword: Tapioca starch; Alumina nanoparticle (Al₂O₃); Tensile strength; Scanning electron microscopy