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Flexural analysis of polyurethane foam and sandwich composite foam via experimental and finite element Cmethods

Abstract

Polyurethane (PU)/montmorillonite (MMT) composite foam were synthesized with reaction of diisocyanate with polyester polyol by a batch process. In this research, water was used as the blowing agent with TEGOSTAB B8407 and TEGOAMIN PMDETA as the surfactant and catalyst, respectively. Clay was used as filler for composite PU foam with the percentages varied from 0 wt% to 5 wt%. Polyurethane foam (Al-PU) sandwich composite was prepared using hand-lay up method where Al sheet was stacked onto PU foam using adhesive. The samples were characterized using flexural test analysis. Observations showed that PU foam has better failure deformation with flexural extension increased up to 9.44 mm. However, flexural stress and optimum load for sandwich composite are up to 3.63MPa and 410.78N respectively. Furthermore, Al sheet act as ductile skin to PU foam and prevent samples from rupture rapidly or avoiding the existence of brittle fracture. Modeling of composite using finite element software shows the ductile-like failure behavior in sandwich composite Al-PU foam even though the core itself is a rigid brittle foam.

Keywords; Finite Element Analysis (FEA), Flexural, Polyurethane Foam, Sandwich Composite