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CONTINUOUS GLASS FIBER REINFORCED FOAMS: EFFECTS OF THERMOPLASTIC CELLULAR MATRIX ON MECHANICAL AND IMPACT PROPERTIES

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Thermoplastic polymers are replacing thermosetting resins in many applications as matrix for composite structures. Among their many advantages, thermoplastics can absorb gas in the amorphous phase and be foamed in appropriate processing conditions. This property was exploited to prepare glass fiber reinforced composite structures with foamed matrix. Poly(ethylene naphthalate) - PEN was employed as matrix for preparing glass fiber reinforced composites (reference composites) with different fiber volume content. Carbon dioxide, used as blowing agent for the polymer, was solubilized in samples by means of an high pressure vessel and then a solid state foaming process was applied to induce microcellular structure in the matrix (foamed composites). The microcellular morphology of samples was evaluated trough optical and SEM analyses. Characteristic parameters of foamed matrix were calculated and related to both processing conditions and reinforced composites composition. Mechanical (quasi-static and impact) and thermomechanical (DMA) properties of pristine and foamed composites were evaluated and results were related to density and morphologies of the developed reinforced structures. Flexural, as well as impact properties, were heavily affected by the presence of microcells in the matrix and foamed composites exhibited improved specific properties with respect to the reference composites. The effects of microcells in the polymeric matrix on the specific properties resulted to be dependent on the glass fiber volume content.