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EXPERIMENTAL VALIDATION OF A THERMAL CONDUCTIVITY MODEL FOR POLYMER COMPOSITES WITH SHORT GLASS FIBERS

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Thermoplastic polymer composites containing short glass fibers are used more and more in many applications. Moreover, they conjugate excellent mechanical properties (good resistance to failure, high modulus) to the possibility of welding. They are mostly processed using injection molding, which permits elevated cadences. Because of their price and their performances, they are mainly dedicated to technical pieces (located under motor hood for example). Their properties and notably the thermal conductivity tensor must be known with accuracy for simulation of molding process and/or for prediction of their thermo-mechanical behavior in severe thermal environment. As a consequence of the flow during injection molding, the fibers are oriented, leading to materials with anisotropic properties. We present experimental results of the conductivity tensor of IXEF. This composite is made of a m-xylylene adipamide matrix associated to short glass fibers (between 0 and 50wt%). The measures have been done within the range 20℃-250℃, from solid to melted state. Two techniq ues have been used to measure the conductivity. The guarded hot plate was used to measure the conductivity in two directions (normal and parallel to the flow).
The second device is an instrumented mold, specially designed for the determination of the transverse to the flow effective conductivity. The identification is done by the solving of an inverse heat conduction problem Finally, a model issued from the Mori and Tanaka theory, initially developed for the prediction of mechanical properties, has been used. It has been associated to the local orientation tensor of fibers to calculate effective conductivity of the parts. The experimental results are compared to the model, revealing a good agreement.