

Forming Simulation of Thermoplastic Pre-Impregnated Textile Composite

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Abstract : The process of thermoforming a carbon fiber reinforced thermoplastic (CFRTP) has increased its presence in the automotive industry for its wide applicability to the mass production car. A non-isothermal forming for CFRTP can shorten its cycle time to less than 1 minute. In this paper, the textile reinforcement FE model which the authors proposed in a previous work is extended to the CFRTP model for non-isothermal forming simulation. The effect of thermoplastic is given by adding shell elements which consider thermal effect to the textile reinforcement model. By applying Reuss model to the stress calculation of thermoplastic, the proposed model can accurately predict in-plane shear behavior, which is the key deformation mode during forming, in the range of the process temperature. Using the proposed model, thermoforming simulation was conducted and the results are in good agreement with the experimental results.

Keywords : carbon fiber reinforced thermoplastic, finite element analysis, pre-impregnated textile composite, non-isothermal forming

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