

Numerical Analysis of Anisotropic High Viscosity Fluid for Press Molding of Carbon Fiber Reinforced Thermo Plastic

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ABSTRACT

Carbon Fiber Reinforced Plastic (CFRP) is used in various industrial products such as automobiles and aircraft. Most of the cases today, CFRP is produced with thermosetting resin such as Epoxy as a matrix. However, products made of CFRP using thermoset matrix are difficult to mass production. Therefore, they are too expensive to spread widely in the market.

To overcome the disadvantages of CFRP, Carbon Fiber Reinforced Thermo Plastic (CFRTP) is receiving a lot of attention. CFRTP is capable to be processed with press molding, which CFRP is not able to do with. Therefore, it is expected to reduce the production cost.

Verifying the molding process with the prediction of fiber orientation and density numerically calculated is very important to improve the reliability of products. In press molding process, UD prepreg sheets (fibers aligned in the same direction) are used as base material. UD prepreg sheet is a high viscosity material and it show the highly anisotropic viscosity and hence it is very difficult to analyse the flow of UD prepreg sheet in press molding.

Moving Particle Semi-Implicit method (MPS [1]) is a kind of particle method, which dose not require the mesh to analyse the flow field. Therefore, we can simply treat the free-surface, large-deformation system and complicated shape using MPS. Moreover, at MPS formulation, governing equation is treated as a strong formula and hence we can discretize any complicated equation simply substitute MPS partial differential model for partial differential term.

In this study, we analyse the anisotropic high viscosity fluid whose mechanical property is similar to UD prepreg (measured by Ishikawa et al [2]) using MPS and discuss the validity of the analysis.

REFERENCES

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