

## High-fidelity Reconstruction Algorithm for Modeling of Sheet Molding Compound (SMC) Composites

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### ABSTRACT

This paper introduces a multiscale modeling method for sheet molding compound (SMC) composites through a novel bundle packing reconstruction algorithm based on a micro-CT (Computed Tomography) image processing. Significant inhomogeneity and anisotropy from the complex flow pattern during the compression molding process pose a tremendous challenge to predict the properties of SMC composites. The statistical distributions for the fiber orientation and dispersion are characterized from micro-CT images of real SMC composites. After that, a novel bundle packing reconstruction algorithm for a high-fidelity SMC model is proposed by considering the statistical distributions. A method for evaluating specimen level's strength and stiffness is also proposed from a set of high-fidelity SMC models. Finally, the proposed multiscale modeling methodology is experimentally validated through a tensile test.

### REFERENCES

Chen, Z., Huang, T., Shao, Y., Li, Y., Xu, H., Avery, K., Zeng, D., Chen, W., Su, X. (2018), "Multiscale finite element modeling of sheet molding compound (SMC) composite structure based on stochastic mesostructure reconstruction", *Compos. Struct.*, **188**, 25-38.

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