FREE BOUNDARY VISCOUS FLOWS AT MICRO AND MESOLEVEL DURING LIQUID COMPOSITES MOLDING PROCESS

Z. Dimitrovová [(a)]; S. G. Advani [(b)]

[(a)] IDMEC, Instituto de Engenharia Mecânica, Tel.: + 351 218 419 462, Fax: + 351 218 417 915, e-mail: zdimitro@dem.ist.utl.pt

/ .Instituto Politécnico de Lisboa, Instituto Superior de Engenharia de Lisboa, Departamento de Engenharia Mecânica, Rua Conselheiro Emídio Navarro, 1949-014 Lisboa, Portugal, e-mail: zuzana@dem.isel.ipl.pt,

[(b)] University of Delaware, Department of Mechanical Engineering, 126 Spencer Laboratory, Newark, DE 19716, Tel.: + 1 302 831 8975, Fax: + 1 302 831 3619, e-mail: advani@me.udel.edu,

Publicado em: *CD de comunicações e Acta do 14th International Conference on Composites Materials, pp. 598-599, 14-18 de Julho, 2003, San Diego, California, EUA.*

Numerical simulation aspects related to low Reynolds number free boundary viscous flows at micro and mesolevel during the resin impregnation stage of the Liquid Composite Molding (LCM) Process are presented in this article. Free boundary program (FBP), developed by the authors is used to track the movement of the resin front accurately by accounting for the surface tension effects at the boundary. Issues related to the global and local mass conservation (GMC and LMC) are identified and discussed. Unsuitable conditions for LMC and consequently GMC are uncovered in mesolevel filling at low capillary number, and hence a strategy for the numerical simulation of such flows is suggested.

FBP encompasses a set of subroutines that are linked to modules in ANSYS. FBP can also capture the void formation dynamics based on the analysis developed. We present resin impregnation dynamics in two dimensions. Extension to three dimensions is a subject for further research. Several examples of stabilization validation techniques are compared.