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## Fluid flow modelling in tape casting of ceramics: analytical and numerical approaches

M. Jabbari<sup>a</sup>, J. H. Hattel<sup>b</sup>

Since its onset, tape casting has been used to produce thin layers of ceramics that can be used as single layers or can be stacked and laminated into multilayered structures. Today, tape casting is the basic fabrication process that provides multilayered capacitors and multilayered ceramic packages. In addition, many startup products such as multilayered inductors, multilayered varistors, piezoelectrics, ceramic fuel cells and lithium ion battery components are dependent upon tape casting technology. One of the growing sciences in the processing of ceramics by tape casting is the use of fluid flow analysis to control and enhance the final tapes. The fluid dynamics analysis of the ceramic slurries during tape casting is an efficient mean to elucidate the physical parameters crucial to the process.

In this study fluid flow analysis is used to control the most important parameter in the process, i.e. the tape thickness, both numerically<sup>1</sup> and analytically<sup>2,3</sup>. The developed numerical model is then used to track the interface between two fluids which are tape cast adjacently<sup>4</sup>. Moreover, the migration of a secondary phase inside the ceramic slurry is modelled<sup>5</sup>.

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<sup>1</sup> Jabbari and Hattel, *J. Am. Ceram. Soc.* **96**, 1414-1420 (2013).

<sup>2</sup> Jabbari et al., *Mater. Sci. Tech.* **29**, 1080-1087 (2013)

<sup>3</sup> Jabbari and Hattel, *Mater. Sci. Tech.* **30**, 283-288 (2014)

<sup>4</sup> Jabbari et al., *Int. J. Refrigeration* **36**, 2403-2409 (2013)

<sup>5</sup> Jabbari et al., *App. Math. Modell.* (under review)

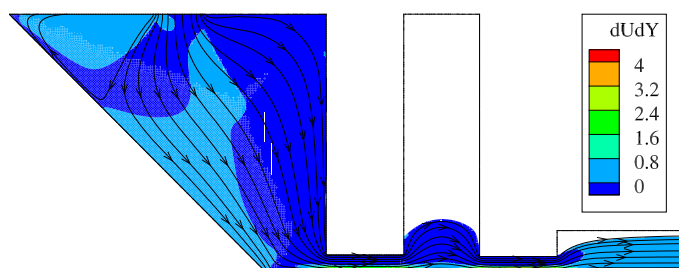


Figure 1: Contour of  $du/dy$  in tape casting of a non-Newtonian ceramic slurry using two doctor blade