Quasi-steady state power law model for flow of \((La_{0.85}Sr_{0.15})_{0.9}MnO_3\) ceramic slurry in tape casting

One of the most common ways used to produce multilayer ceramics is tape casting. In this process, the wet tape thickness is one of the single most determining parameters affecting the final properties of the product, and it is therefore of great interest to be able to control it. In the present work, the flow in the doctor blade region of a slurry containing \((La_{0.85}Sr_{0.15})_{0.9}MnO_3\) (LSM) material is described with a simple quasi-steady momentum equation in combination with an Ostwald–de Waele power law constitutive equation. Based on rheometer experiments, the constants in the Ostwald–de Waele power law are identified for the considered LSM material and applied in the analytical solution for the tape thickness. This solution is then used for different values of substrate velocity and doctor blade height and compared with experimental findings of the wet tape thickness, and good agreement is found.