Effect of viscoplasticity in slot coating flow

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Continuous liquid coating is used to produce various films or sheet-like products, such as adhesive tapes, optical films, display panels, etc. It is also a strong candidate for nanoparticle assembly film production. Slot coating is a popular high-precision coating methods, because the film thickness is directly controlled by the flow rate and substrate speed rather than coating liquid properties. However, many high-performance multi-functional films for electronics and optical devices require nano- or micro-sized particles inside a coating liquid. As the environment requirements push to use less solvent, the coating liquid becomes dense suspension. Consequently, the liquid shows complex non-Newtonian behavior including viscoplasticity, i.e. exhibiting little or no deformation up to a certain level of stress. This study presents the impact of viscoplasticity on the operating limits of slot coating in both experiments and computations.