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The Effect of Inorganic Particles on Slot Die Coating of Poly(Vinyl Alcohol) Solutions

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The present study examines the slot die coating of poly(vinyl alcohol,PVA)solutions with particles such as TiO_2 and SiO_2 added. Physical properties such as viscosities and surface tensions of PVA solutions with particles were measured and analyzed. The coating experiment was carried out in a lab coater and a flow visualization technique was applied to observe the flow behavior in the coating bead region. The effect of different particles, particle sizes, concentrations and surface characteristics were analyzed on the coating window of PVA solutions. It was found that adding a certain amount of particles to PVA solutions can effectively expand the operating window of PVA solutions. The attraction of function groups of PVA to the particle surfaces can both increase the fluid viscosity and surface tension, and surface tension is the dominant factor for the expansion of coating windows. The results of flow visualization indicate that the upstream meniscus can be stabilized by the addition of particle. The commercial software package FLOW3D was successfully applied to simulate the flow field in the coating bead region.