

Heterogeneity on stress development in suspension coating process

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Coating materials which contain particles, binder, and additives are considered as complex fluids from the rheological point of view. They show complicating behavior under high shear coating flow and form heterogeneous microstructure due to non-uniform distribution of binder and solvent, particle aggregation. Heterogeneity influences stress development during film formation resulting in coating failure like crack, curling and deformation etc. Therefore, evaluating the heterogeneity and understanding its effect on stress development is highly desired to achieve defect-free coating. We studied heterogeneity of coating materials and its effect on stress development of films formed from poly(vinyl alcohol)(PVA) solution, pure silica and PVA/silica suspension of varying composition and concentration. The heterogeneity of coating materials is characterized with particle tracking microrheology technique and the coating stress development was measured in situ during drying with cantilever deflection method. Our approach explains stress development in coating process in terms of heterogeneity of coating material which is dependent upon both concentration and composition of PVA-silica suspension.