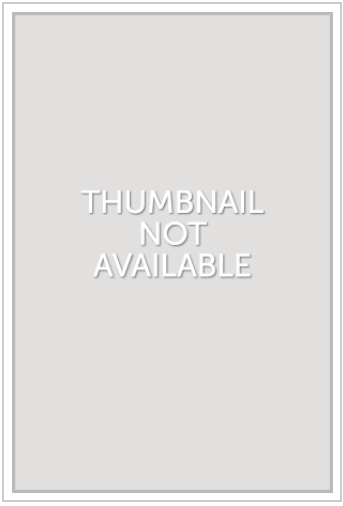

Influence of Process and Material Parameters on the Draw Resonance Instability

By Mathias Bechert

FAU University Press Okt 2017, 2017. Taschenbuch. Condition: Neu. Neuware - In this work, the influence of process and material parameters on the draw resonance instability in film casting and fiber spinning is investigated both theoretically and experimentally. Draw resonance generally occurs if the draw ratio, i.e., the ratio of outlet to inlet velocity, exceeds a critical value, and manifests itself in steady oscillations of the flow velocity and the geometric properties of the fibers and films.Several Newtonian and viscoelastic models for film casting and fiber spinning are derived and the critical draw ratio is determined by means of linear stability analysis in order to investigate the influence of various effects like gravity, inertia, neck-in and strain hardening on draw resonance. Moreover, physical mechanisms underlying the instability are revealed and alternative stability criteria are reviewed and extended. Employing control parameters with strong connection to practical application, the results are visualized in stability maps, which enable both a quick determination of the critical draw ratio and a partition of the parameter space into several dynamical regimes. The theoretical results are completed by an experimental study on draw resonance in fiber spinning. Using an effective relaxation time, the measured critical draw ratios...

Reviews

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