Temperature effect on dynamic wetting of cellulosic substrates by molten polymers for composite processing

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Abstract

Impregnation of plant fibre reinforcements by a molten polymer involves many phenomena still poorly understood, related to the solid morphology and its surface chemistry, but also to the temperature effect on liquid properties and solid/liquid interactions. The present work focuses on the temperature effect on forced dynamic wetting, using the Wilhelmy method and two model materials: a cellulosic film and two totally wetting paraffin oils. The results show that the dynamic contact angle vs. the capillary number (Ca) plot appears as a master curve. This curve is split in two domains. The domain associated with $Ca > 10^{-3}$ is well described by the hydrodynamic approach. The domain with $Ca < 10^{-3}$ corresponds to wetting processes operating on a smaller scale, which are more sensitive to the physico-chemical

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