

Abstract Submitted
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Measurement of Unsteady Stress Field of Extending Liquid Polymer¹ MASAKAZU MUTO, YOSHIYUKI TAGAWA, Tokyo University of Agriculture and Technology — Understanding of the behavior of extending liquid polymer is important for various applications such as inkjet printing. The objective of this study is to develop a novel experimental technique to visualize the extensional stress field of extending liquid polymer by utilizing the principles of photoelasticity. The proposed system is a non-contact optical measurement method based on the retardation obtained by the changes of polarization state of the liquid polymer, which results in proportional stress values. A high-speed polarization camera containing an array of micro linear polarizers with four incident angles is used to capture the photoelastic phenomenon at high frame rates. The measuring target is a column of extending liquid polymer. This extension is exerted by a CaBER-Dos (Capillary Breakup Extensional Rheometer Dripping onto Substrate) system, by which it is possible to measure the intensity of extensional stress. The result obtained from the technique, which combines photoelasticity and CaBER-Dos systems, shows an increase of retardation of the liquid polymer as it is extended. Thus, extensional stress field can be visualized experimentally with calibration between the retardation and the extensional stress within an error of 13.1%.

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