

Automatic Flow Analysis for Blood Using a Newly Developed Compact-Sized Falling Needle Rheometer

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A compact-sized falling needle rheometer with quick operation and automatic flow analysis has been developed for viscometry of anticoagulated blood. The volume of a sample of blood only needs to be 4 mL and the measuring time is within 3 min. Measured flow properties of human blood and rabbit blood with anticoagulant are evaluated as a flow curve showing the relationship between the shear stress and shear rate. The accuracy and the reproducibility of the presented rheometer are ascertained by viscosity measurements of standard liquid for calibration of viscometers manufactured by Nippon Grease Co., Ltd. Good uncertainty within $\pm 0.5\%$ and reproducibility within $\pm 1.0\%$ are confirmed by comparison with reference data of standard liquids. Observed flow curves of the human, rabbit and pig bloods with or without anticoagulant show three typical fluid regions, these are, the Non-newtonian fluid region for a low shear rate range of $0-200 \text{ s}^{-1}$, the transition region for the range about 150.