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**Viscosity measurement method of non-Newtonian fluids in pressure-driven flows based on energy dissipation rate.**[1] WOOK RYOL HWANG, HYE KYEONG JANG, Gyeongsang National University, SUN OK HONG, Ajou University, SANG BOK LEE, Korea Institute of Materials Science, JU MIN KIM, Ajou University — A novel viscosity measurement method is presented, which is established on the balance of the energy dissipation rate such that the external power is dissipated within the system as viscous dissipation in a laminar. The effective viscosity can be expressed algebraically in terms of the pressure drop and flow rate and the corresponding effective shear rate is readily determined by flow rate; the relationship between effective viscosity and effective shear rate is found identical to the true material viscosity behavior. The two flow numbers, which depend on flow geometry only and are almost independent of fluid rheology, are involved: the coefficient of energy dissipation rate that associates the total energy dissipation rate to the Reynolds number; and the coefficient of effective shear rate, which relates flow rate to effective shear rate. Three different flows with complicated geometries were tested: numerical validations for axisymmetric expansion-contraction flows and flows in a Kenics mixer, and experimental validation for flows in a complex microfluidic array with Xanthan gum solutions.

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