Thermo Haake
Material Characterization

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Abstract: A study to determine which rheological model was most appropriate for characterizing gypsum plaster pastes was undertaken. HAAKE rheological equipment was employed by applying a step-wise decreasing shear rate sequence and measuring the corresponding steady shear stress values. Coaxial cylinders (MVI) defined the system geometry, and the shear rate was varied from 26–1198 sec–1. Equilibrium flow curves for five different concentrations of gypsum plaster in distilled water were experimentally generated, and can be seen on Figure 2.

Twelve different models were utilized to fit the data with anywhere from two to four adjustable parameters. The criteria employed to judge the models were statistical variance; applying a physical meaning to the parameters; and the model's prediction capacity beyond the limits of the experimental data. A further discrimination was made by evaluating the stability of best-fit parameters over narrow shear rate ranges. The Casson model was reasoned to be the best overall model. Interestingly, the Casson model was also judged best for cement pastes.

$$\sqrt{\tau} - \sqrt{\tau_0} = \sqrt{\eta \dot{\gamma}} \quad \text{(Casson Equation)}$$

This expression has two adjustable parameters τ_0 and η, where τ_0 is the yield stress and η is the asymptotic viscosity.

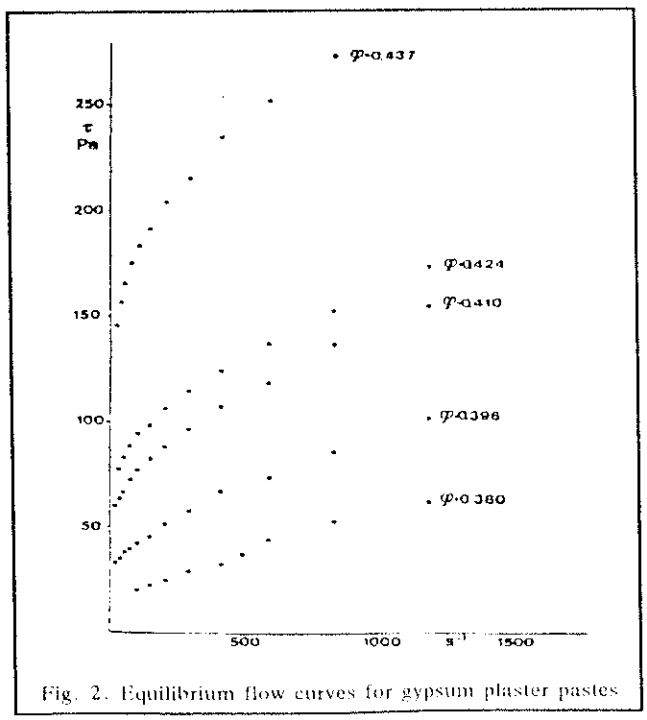

Fig. 2. Equilibrium flow curves for gypsum plaster pastes

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