

# RHEOLOGICAL BEHAVIOR OF MATURE FINE TAILINGS

Amir Malmir, Jourdain H. Piette and Savvas G. Hatzikiriakos  
Chemical and Biological Engineering Department  
The University of British Columbia, Vancouver, BC, CANADA

## ABSTRACT

The rheological behavior of mature fine tailings (MFTs) is investigated using transient and steady shear flow fields. First, the structure breakdown of intact MFT samples is examined by startup flow experiment at various shear rates. The yield stress of MFTs is estimated by the steady shear stress values at low shear rates. MFT samples exhibit thixotropy and positive hysteresis loop at short shearing time intervals in increasing and decreasing step-wise shear rate tests. The observed hysteresis loops and thixotropy disappear by increasing the shearing time intervals, as the systems reaches its equilibrium steady state structure. The time-dependent rheological behavior of MFTs is quantified by a structural kinetics model through dimensionless structure parameter,  $\lambda$ . (Toorman, *Rheologica Acta*, 36, 56-65 (1997)). The kinetic parameters are estimated based on steady-state stresses, elucidating the relative effects of shear rate and Brownian motion on build-up and breakdown of the structure. The flow behavior of MFTs predicted by structural kinetics model is nearly in agreement with the experimental data.