

## **Genuine and Apparent Nonlinearities in the Rheology of Glasses**

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### **Abstract**

Starting out from the basic principle of cylinder compression it is demonstrated that the visco-elastic behavior of fused silica conforms closely to a Maxwell model. The constitutive parameters Young's modulus,  $E$ , and the viscosity,  $\eta$ , depend on both temperature and stress. Without reference to any physical interpretation it is feasible to superpose all stress relaxation functions (when normalized to the initial peak stress) by rescaling the time axis (thermo-rheological simplicity). The normalization parameter depends markedly on temperature and to a minor degree on stress. Numerous reports in the literature state that the viscosity of silicate melts decreases with rising strain rate and stress, respectively. In reality, such results can be traced back to an erroneous application of Maxwell's model and the disregard of the elastic properties of the samples.

**Key words:** fused silica, Maxwell model, visco-elasticity, nonlinearity, cylinder compression, viscosity

