Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Rheo-Dielectric Studies of Concentrated Polyisoprene Solutions
JAI PATHAK, RICCARDO CASALINI, C. M. ROLAND, NRL, Chemistry, SIMONE CAPACCIOLI, University of Pisa, Physics , NIKOS HADJICHRISTIDIS, University of Athens, Chemistry — We have performed dielectric spectroscopy on concentrated and well-entangled Cis-1,4-Polyisoprene solutions in n-tetradecane while they undergo steady step shear. The volume fraction of polymer is 0.2, and the number of entanglements per chain varies between 20 and 30. Cis-1,4-Polyisoprene is a Stockmayer Type-A dipole, with one dipole moment component along the chain backbone. Hence dielectric spectroscopy on it reveals the global chain relaxation (normal mode), in addition to its segmental mode relaxation. We critically examine the normal mode in strongly non-linear flows in the cone (22.8 mm diameter)-platen (25 mm) geometry. We work with a sea of fluid surrounding the cone, and the edge remains intact deeper into the shear thinning regime. In addition to visual inspection of the sample edge, we also check for validity of the Cox-Merz rule, finding good agreement between the two. Preliminary results indicate that the dielectric strength continually decreases well into the non-linear regime, perhaps a consequence of the orthogonal directions of the dielectric measurement (velocity gradient direction) and the chain stretching (flow direction).

Jai Pathak
NRL. Chemistry

Date submitted: 27 Nov 2007 Electronic form version 1.4