Energy Dissipation due to Polymer Elastic Instabilities

Siva A. Vanapalli, Department of Chemical Engineering, Texas Tech University

Polymer solutions are widely used in enhanced oil recovery applications as viscosity modifiers for mobility control. The increased flow resistance offered by polymeric liquids, particularly in high permeability zones improves the reservoir sweeping efficiency resulting in enhanced oil recovery. The origin of the flow resistance could lie in elastic instabilities that are known to occur in flows with curved streamlines characteristic of porous media. However quantitative data on frictional resistance induced by elastic instabilities and its dependence on polymer parameters is lacking. To fill this gap, we are developing a generic framework for quantifying the frictional drag due to polymer-induced elastic instabilities in curved channels. Notable outcomes to date include

- Development of a microfabricated device mimicking tortuous paths in porous media
- In situ measurement of temporal variations in flow resistance due to polymer-induced elastic instabilities