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Reversible and irreversible flow-induced phase transition in micellar solutions[1] RADHAKRISHNA SURESHKUMAR[2], MUKUND VASUDEVAN, ERIC BUSE, Washington University in Saint Louis, HARE KRISHNA, RAMKI KALYANARAMAN, Washington University in Saint Louis, BAMIN KHOMAMI, University of Tennessee, Knoxville, AMY SHEN, Washington University in Saint Louis — It is well known that wormlike micelles form shear-induced structures (SIS). SIS formation is typically accompanied by the appearance of a gel-like phase. While both configurational dynamics of the micelles in flow and electrostatics are recognized as the key factors that influence such phase transitions, there are no universally applicable criteria for the onset strain rate as function of salt concentration. In this work, first, we examine the effect of salt concentration on the critical strain rate for CTAB/NaSal solutions and show that a "self-similar" phase transition regime exists. Second, we show that under strong (elongational) flow conditions, the phase transitions are irreversible, leading to the formation of gels that are stable even after the flow is stopped. Results obtained from atomic force microscopy studies of the structure of such gels will be presented.

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