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Modeling of irreversible flow-induced gelation in wormlike micellar solutions NEVILLE DUBASH, JOSHUA CARDIEL, PERRY CHEUNG, AMY SHEN, University of Washington — Wormlike micellar solutions are known to exhibit a variety of interesting phenomena, one of which is the formation of gel-like structures under simple flow conditions. Previously, these flow-induced structures were all observed to be temporary, and the gels would dissipate upon cessation of the flow. Recently, however, it has been shown that it is possible to produce a purely flow-induced irreversible transformation in certain micellar solutions. This irreversible gel formation is brought about via a mixed shearing/extensional flow in which the fluid experiences very high rates of strain and total strains. Here, we examine this gelation phenomenon and present a model which is able to capture the irreversible rheological changes observed in our experimental system. The model is based on an existing network scission model for micellar solutions that contains two species of interacting, elastically-active micellar chains.

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