

Abstract Submitted  
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**Stress and Structure Relaxations in Smectic Liquid Crystal Elastomers**<sup>1</sup> DENA MAE AGRA-KOOIJMAN, MICHAEL FISCH, Kent State University, WANTING REN, PHILIP MACMULLAN, ANSELM GRIFFIN, Georgia Institute of Technology, SATYENDRA KUMAR, Kent State University, KSU TEAM, GIT COLLABORATION — Randomly oriented smectic domains (polydomain) in liquid crystal elastomer orient under uniaxial stress to form an optically monodomain sample. We studied the dynamics of stress relaxation and how it depends on the changes in microscopic elastomer structural during the polydomain to monodomain (PM) transition by x-ray diffraction. The results of stress relaxation data can be well approximated by a double exponential equation,  $\sigma(t) = \sigma_1 \exp(-t/\tau_1) + \sigma_2 \exp(t/\tau_2)$  involving short ( $\tau_1 \sim 1$  min), and long ( $\tau_2$ ) relaxation times. The long relaxation time,  $\tau_2$  is strain dependent and it decreases exponentially from 18 to 10 min with increasing strain. The structural relaxation is well described by a single exponential function with constant,  $\tau_\alpha$ , which is  $\sim 45$  min in the polydomain region, and  $\sim 8$  min in the monodomain state. The difference between the stress and structural relaxations is attributed to the underlying factors involved during the PM transition. The stress relaxation is associated with the slippage of polymer chains, while structural relaxation is attributed to the rotation of the smectic domains.

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