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Effect of Polymer on Response Time in an Electroclinic Elastomer[1] FRANK BENTREM[2], CHRISTOPHER SPILLMAN, AMIT KAPUR, STANISLAS TSOI, JAWAD NACIRI, BANAHALLI RATNA, Center for Bio/Molecular Science and Engineering, Naval Research Laboratory, Washington, DC, 20375, USA — The molecular switching time of an electroclinic liquid crystal elastomer is examined in response to increasing electric field as a function of temperature and cross-linking density. There is an initial increase in the characteristic molecular switching time that reaches a maximum value at intermediate field strengths. Further increasing the field strength decreases the elastomer switching time in an expected manner. We analyze the electro-optic response observed in the material at the molecular scale and identify three predominant time regimes. These three regimes offer insight into the response of both the tethered liquid crystal mesogens and the effect of polymer backbone. The results provide fundamental insight into the nature of the elastomer response to an electric field, where the resistive restoring force of the polymer backbone in the elastomer is countered by the forces exerted by the realignment of the permanent electric dipole of the electroclinic mesogens.

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