**Read me**

We report polarised dielectric and rheological data of a liquid crystal elastomer displaying a mechanical Frèedericksz transition and a partial auxetic response as a function of strain. These data sets are relevant to the paper “Influence of liquid crystallinity and mechanical deformation on the molecular relaxations of an auxetic liquid crystal elastomer” published under MDPI Molecules (https://doi.org/10.3390/molecules26237313). The data sets include all the data associated with the figures in the article.

The data in the depository are as follows:

“Fig. data”:

* Eps’’ data for the nematic LCE for various temperatures
* Relaxation time-scale of $α$, $β$, $γ$ against 1000/$T$
* Stickel analysis of the $α$ relaxation
* Walden plot of conductivity
* Rheological master curve
* Scaled $α$ relaxation for BDS and Rheology
* Volume of correlated motions in the isotropic LCE
* Storage and Loss modulus against true strain
* Eps’’ against true strain and $α$ relaxation time-scale against true strain.