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The relaxation of a prolate leaky dielectric drop in a uniform DC electric field ADITYA KHAIR, JAVIER LANAUZE, LYNN WALKER, Department of Chemical Engineering, Carnegie Mellon University — We quantify the relaxation of a prolate leaky dielectric drop upon removal of a uniform DC electric field. Experiments consisting of a castor oil drop suspended in a silicone oil are compared against boundary integral simulations that account for transient charging of the interface. Charge relaxation causes a marked asymmetry in the drop evolution during deformation and relaxation. In particular, during relaxation a prolate to oblate shape transition is observed before the drop recovers its equilibrium spherical shape. Furthermore, the high field strengths utilized in the experiments yield a fast drop relaxation in comparison with the transient development towards the steady deformation. The storage and release of capacitive energy and capillary energy is then quantified during deformation and relaxation, respectively. Finally, we present computational results for a drop that does not relax back to its initial spherical shape upon removal of the field; rather, the drop breaks up.

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