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Breakup of compound viscous threads with electrostatic and electrokinetic effects[1] RICHARD CRASTER, DEVIN CONROY, DEMETRIOS PAPAGEORGIOU, OMAR MATAR, Imperial College London — The breakup of electrified viscous compound jets surrounded by a dielectric gas are investigated theoretically. The fluids are considered to be electrolytes and the core fluid viscosity is assumed to be much larger than that of the annular fluid. Axisymmetric configurations are considered with the three fluids bound by a cylindrical electrode that is held at a constant voltage potential. The model equations are investigated asymptotically in the long wave limit, yielding two cases corresponding to a negligible surface charge with electrokinetic effects and a leaky dielectric model. A linear stability analysis for both cases is performed and the electrical effects are found to have a stabilizing effect, which is consistent with previous investigations of single electrified jet breakup at small wave numbers. The one-dimensional equations are also solved numerically. The electric field is found to cause satellite formation in the core fluid, which does not occur in the purely hydrodynamic case, with the satellite size increasing with the strength of the electric field.

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