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Vibrational kinetics in a Cl_2 inductively-coupled plasma[1] BENJAMIN PRUVOST, JEAN-PAUL BOOTH, MICKAEL FOUCHER, PASCAL CHABERT, LPP-CNRS, VASCO GUERRA, IST, Lisbon, ILYA FABRIKANT, U. Nebraska, MARK KUSHNER, U. Michigan — Inductively-coupled plasmas containing chlorine are widely used for conductor-etch applications, often using mixtures with HBr and O_2. We are carrying out an extensive comparison of experimental measurements with simulations using the Hybrid Plasma Equipment Model (HPEM). Vibrationally excited states of chlorine have historically been ignored in models, but recently we found that inclusion of a simple vibrational kinetic scheme in HPEM significantly improves the model agreement with experiment. Here we will present a more complete scheme, using calculated state-to-state cross-sections (up to v=5) for electron impact excitation and state-specific V-T (Cl_2-Cl_2 and Cl_2-Cl) and V-V (Cl_2-Cl_2) transfer rates. Initially the scheme has been implemented in a global model, which predicts vibrational temperatures up to 2500K at low pressure (3mTorr), dropping to ∼700K at 50 mTorr. We are attempting to measure the vibrational distribution using broadband ultraviolet absorption spectroscopy. Vibrationally excited states play a key role in gas heating, as well as significantly enhancing electron attachment, and should not be ignored.

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