Abstract Submitted
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Diagnostics of inductively-coupled plasmas in HBr: Bromine atom and electron densities[1] JEAN-PAUL BOOTH, NISHANT SIRSE, ROBERT SORIANO, MICKAEL FOUCHER, PASCAL CHABERT, LPP-CNRS, Ecole Polytechnique — Inductively-coupled plasmas (ICP) containing hydrogen bromide are widely used gas for conductor-etch applications, often using mixtures with Cl_2 and O_2. However, very few scientific studies (whether theoretical, simulation or experimental) have been made of HBr plasmas. We have studied pure HBr plasmas in an industrial-scale ICP (diameter 550mm, height 100mm, excited at 13.56MHz by a 4-turn planar coil) adapted for advanced diagnostic techniques. We have developed a new detection scheme for Br atoms using two-photon laser-induced fluorescence (TALIF). The relative variation of Br atoms was determined as a function of HBr pressure (5-90 mTorr) and RF power (20-500W). The Br density increases with pressure over this range, although the dissociation fraction (Br density divided by the total gas pressure) decreases with pressure. The Br density also increases with RF power up to about 100W, but then progressively saturates. The Br decay rate was measured in the afterglow of a pulsed plasma. The electron density was determined using a microwave hairpin resonator, and was found to peak. at 10 mTorr HBr pressure at all RF powers. This behaviour is very similar to that observed in pure Cl_2, although the densities are about a factor 2 lower in HBr.

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