Abstract Submitted
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Producing ion waves from acoustic pressure waves in pulsed ICP: Modeling vs. Experiments EMILIE DESPIAU-PUJO, GILLES CUNGE, MAXIME DARNON, NADER SADEGHI, CNRS/Univ. Grenoble Alpes/CEA, LTM, NICHOLAS BRAITHWAITE, Open University — Neutral depletion is an important phenomenon in CW high-density plasmas, mostly caused by gas heating - with a small contribution due to electron pressure Pe - under typical material processing conditions. In pulsed ICP, neutral depletion plays an important role on radical transport in the afterglow. At the beginning of the afterglow, Pe drops rapidly (10μs) by electron cooling and the gas cools down as well. It generates a neutral pressure gradient between the plasma bulk and the reactor walls, which in turn forces the cold surrounding gas to move rapidly towards the center, thus launching an acoustic wave in the reactor. Fast gas displacement is evidenced by measuring Al atoms drift velocity in the early afterglow of a Cl2/Ar discharge by time-resolved LIF, the acoustic wave in the chamber being observed by mass spectrometry. 2D fluid simulations of Cl2 pulsed ICP predict similar results. These phenomena are further studied during both the plasma ignition and afterglow using modeling and experiments. Strong oscillations are observed both on the Cl2 neutral densities and on the ion flux. As neutrals are pushed towards (or outwards) the chamber walls by the pressure gradient, ions are also pushed in that direction through collisions, as well captured by our ion flux probe.

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