

Abstract Submitted
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Ignition Delay in a Pulsed Inductively Coupled Plasma (ICP) in Tandem with an Auxiliary ICP VINCENT M. DONNELLY, LEI LIU, SHYAM SRIDHAR, DEMETRE J. ECONOMOU, University of Houston — Plasma ignition delays were observed in a “main” ICP, in tandem with an “auxiliary” ICP. The Faraday-shielded ICPs were separated by a grounded metal grid. Power (13.56 MHz) to the main ICP was pulsed with a frequency of 1 kHz, while the auxiliary ICP was operated in continuous wave (cw) mode. In chlorine plasmas, ignition delay was observed for duty cycles greater than 60% and, in contrast to expectation, the delay was longer with increasing duty cycle up to $\sim 99.5\%$. The ignition delay could be manipulated by changing the auxiliary and/or main ICP power. Langmuir probe measurements provided the temporal evolution of electron temperature, and electron and positive ion (n_+) densities. These measurements revealed that the plasma was re-ignited shortly after the decaying n_+ in the main ICP reached the density ($n_{+,aux}$) measured when only the auxiliary ICP was powered. At that time, the depressed electron density increased sharply resulting in plasma re-ignition. Plasma ignition delay occurred when the afterglow of the pulsed plasma was not long enough for n_+ to reach $n_{+,aux}$ during the afterglow. Besides Cl_2 , plasma ignition delays were also observed in other electronegative gases (SF_6 , CF_4/O_2 and O_2) but not in an electropositive gas (Ar).

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