Abstract Submitted
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A scalable, VHF/UHF, capacitively coupled plasma source for large-area applications at high frequencies[1] BERT ELLINGBOE, Dublin City Univeristy, DAVID O'FARRELL, CEZAR GAMAN, Dublin City University, FIACHRA GREEN, NEAL O'HARA, TOMASZ MICHNA, Phive Plasma Technologies — Process results are driving both plasma etch and CVD to higher frequencies; This is incompatible with increases in wafer size to 450mm and beyond. No where is the evidence more clear than in PECVD of amorphous and microcrystalline Silicon for the photo-active layer in thin-film photovoltaic devices. Growth rates for these layers, while maintaining the necessary mechanical and electrical properties, can increase with increasing rf frequency, and in some cases yield superior film properties at the higher deposition rates (P.G. Hugger, etal, MRS 2008). However, in this industry substrate sizes are very large, exceeding 1m characteristic lengths, which puts substantial limits for a conventional plasma diode topology on using frequency as a control vector to increase deposition rate, thus increasing factory through-put and decreasing cost. In this talk we will introduce a novel plasma source topology that enables increased rf frequencies on arbitrary size plasma source without causing wavelength effects. The concept is to segment the powered electrode into discrete tiles; For example as a checkerboard. Adjacent tiles can be powered out of phase with each other. In this way the displacement current coupled by one electrode is balance by and equal and opposite current of the adjacent electrode. Thus zero net current is coupled into the plasma, zero net current is coupled through the sheath above the substrate, and no wavelength effects occur even for substrates large in comparison to the rf wavelength. Highlights of recent results in the operation and application of the plasma source to PECVD of silicon will be presented.

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