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Tailored Voltage Waveforms in an SF6/O2 discharge: slope asymmetry and its effect on surface nanotexturing of silicon[1] G. FISCHER, Institut Photovoltaique d'Ile-de-France, E. DRAHI, G. POULAIN, Total MS-Energie Nouvelles, B. BRUNEAU, E. V. JOHNSON, LPICM, CNRS, Ecole Polytechnique, Universite Paris-Saclay — The nanotexturing of the surface of a crystalline silicon (c-Si) wafer for improved photovoltaic performance can be achieved through the use of a SF6/O2 capacitively coupled reactive ion etching plasma. In this study, we attempt to modify the texturing conditions by taking advantage of slope asymmetries of Tailored Voltage Waveform (TVW) excitation. We show that TVW shapes resembling "sawtooths", presenting a large slope asymmetry, induce high ionization asymmetries in the discharge, and that the dominance of this effect strongly depends on both gas mixture and pressure. These asymmetries have been previously observed in other electronegative gas and are due to differing plasma sheath dynamics at powered and grounded electrode in a discharge operating in drift-ambipolar mode. The texturing of c-Si in SF6/O2 occurs through competing mechanisms, including etching by fluorine radicals and in-situ deposition of micro-masking species. The relative fluxes of etching and passivating species are expected to be strongly varied due to the plasma asymmetry. Morphological and optical characterization of textured c-Si surfaces will give more insight into both the plasma properties and the mechanisms involved in dry nanotexturing.

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