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Model for the investigation of chemical non-equilibrium in a silicon purification process by thermal plasma with validation by spectroscopic measurements MICKAEL MAJCHRZAK, JOCHEN ALTENBEREND, YVES DELANNOY, GUY CHICHIGNOUD, EPM-SIMAP-CNRS, EPM-SIMAP-CNRS TEAM — We have developed a two-dimensional Fluent based model at chemcial non-equilibrium of an Ar-O_2-H_2 plasma. For this model we have calculated the transport properties of the species using the Chapman-Enskog method. Eleven different species were introduced together with 12 reversible chemical reactions. The aim of this work is to give the concentration of the different species which will be present and will react with impurities at the interface between the plasma and the silicon bath. We have developed simultaneously a method for the spatially resolved measurement of the temperature and the concentration of atomic oxygen and atomic hydrogen. The method is based on atomic emission spectroscopy with the assumption of local thermal equilibrium which is validated by the results. At the high temperature gradient between the plasma and the silicon quantitative measurements are not possible. We have also developed a qualitative method for the velocity measurement using the cross correlation between different pixels of a high speed video.

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