Two-dimensional simulation of an inductively coupledplasma discharge of Ar/O_2 including heat transfer, gas flow, andEEDF

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Assuming azimuthal symmetry, an inductively coupled plasma(ICP) discharge based on a fluid model is investigated by coupling multiplephysics simultaneously. In this simulation model, Ar/O_2 plasma dischargeis considered including heat transfer and gas flow. Since the electron energydistribution function (EEDF) is one of the important factor which determinesthe plasma discharge properties, two term Boltzmann approximation is applied toobtain EEDF. Using this EEDF, the plasma discharge is calculated iteratively,until the EEDF and the plasma parameters are converged. Although the method ofobtaining EEDF is based on global parameters, it gives important informationhow the plasma parameters are related. Also, the heat transfer and the gas floware considered to investigate the relations and effects of temperature andpressure profiles to the plasma parameters. In case of gas mixture, the partial pressure profiles of gaswill be changed by process conditions which affect plasma discharge, that theprofiles of temperature and pressure is solved to resolve these effects.Therefore, the EEDF will be modified considering heat transfer and gas flow. Inthis research, the EEDF, temperature and partial pressure profiles are obtainedfor different Ar/O_2 ratio. Finally, the ion energy distribution function(IEDF)on the substrate is calculated using particle model considering all physicalparameters to analyze complex relationship between process and plasmaparameters.

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