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Fluid Modeling of Low Temperature Microwave Microplasmas
AYYASWAMY VENKATTRAMAN, ABHISHEK KUMAR VERMA, Department of Mechanical Engineering, University of California Merced, Merced, CA 95343, USA — Microwave excited microplasmas are of great interest not only to scientific research but also for developing applications in metamaterials, plasma medicine and industrial scale material processing methods. Recently computational modeling and simulation is found to be of immense importance for the advancement in fabrication, designing and developing applications based on microwave microplasma. This work demonstrates our recent developments on suitable computational model and tools for simulation and insights on physical mechanism of microwave microplasma. We performed 1D and 2D continuum simulation of microwave ignited argon microplasma in simple geometries of split ring resonators and microstrip linear resonators. We employed a widely applicable fluid model including full momentum equation and reasonable rate coefficients and transport parameters for high fidelity simulation in our finite volume parallel computational framework. The simulations intend to show the advantages of using microwave sources over DC and RF sources for transferring energy to electrons and dependence of characteristics of generated plasma on various parameters such as frequency and pressure. Comparison between some simulation cases and available experimental results in literature are also presented.

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