

Date: May 27

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Location: Latrobe 107

Speaker: Dr. Yoichiro Matsumoto
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Title: "Multi-Scale Analysis of Nonequilibrium Rarefied Gas Flows"

Abstract

Recently much attention has been paid to the particle simulation such as DSMC and PIC/MC method in order to analyze complex flow fields such as in semiconductor manufacturing processes. In this kind of simulation, several collision models are required such as collision cross section, scattering angle, internal energy transition probability and so on. These models of micro scale phenomena usually have empirical parameters that are decided from the macro scale properties. Therefore, it is doubtful whether these models can be applied to conditions such as non-equilibrium rarefied gas flow. In addition to this, there are a lot of molecules about which no reliable data of macro scale properties are known. In this study, the multi-scale analysis, which connects quantum mechanics and continuum mechanics, is introduced as a new approach to analyze this kind of flow field and to understand these complicated phenomena. As an example of multi-scale analysis, we consider the Jet-CVD process using gas mixtures of silane and hydrogen. The numerical results explain well the experimental ones.