



NUMERICAL SIMULATION OF THE NON-ISOTHERMAL GROWTH OF CARBON NANOPARTICLES FROM EXPERIMENTAL DATA OF SOOT FORMATION AT ETHYLENE PYROLYSIS IN THE SHOCK TUBE

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ABSTRACT

Today there are a lot of experimental data on the soot formation, and works in this area are in progress. Different theoretical models to describe the growth of carbon particles are proposed. Note, however that a full quantitative and qualitative understanding of this process is still lacking. In this paper we propose a simple model for the non-isothermal growth of carbon nanoparticles in the gas phase due to condensation of carbon atoms into primary carbon particles. The numerical simulation of heat transfer and carbon particles is carried out. Our experimental data on the process of soot formation at pyrolysis of an ethylene and argon mixture in a shock tube over the temperature range from 2000 to 3500 K are used as the initial conditions for our calculations. A comparison of the experimental and theoretical results is presented. The results have shown that the proposed simple model of growth and heat transfer of carbon nanoparticles can be used to determine the basic parameters of soot particles.

Keywords: numerical simulation, carbon nanoparticles, soot, shock tube