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Nanoparticle synthesis using high-power modulated induction thermal plasma, and development of a new modulated induction thermal plasma system

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Abstract

We have developed a series of modulated induction thermal plasma system to control the temperature and radical densities in rf thermal plasmas. The most simple modulated induction thermal plasma is a pulse modulated induction thermal plasma (PMITP). The PMITP is sustained by the modulated coil current in a rectangular waveform, making a large disturbance in the thermal plasmas. Such a disturbance in the thermal plasma can control the temperature and radical densities in them, which can be useful to some applications.

In the present talk, the results of PMITP application to nanoparticle synthesis will be presented as an example. The size of nanoparticles could be controlled by the modulation degree of the PMITP. An approach to increase the production rate of nanoparticle synthesis will be shown using the PMITP. In addition, a new type of modulated induction thermal plasma system will be introduced, which can control the temperature of the thermal plasma to trace a given waveform. This new type system is a promising one for several applications.

Curriculum Vitae

Dr.Yasunori Tanaka received the B.S., M.S., and Ph.D. degrees in electrical engineering from Nagoya University, Japan, in 1993, 1995 and 1998, respectively. In April 1998, he was appointed Research Associate at Kanazawa University, Japan. He has been working as Professor since August 2010 at the same university. His research interests include the arc interruption phenomena, thermal plasma fundamentals and their applications such as nanopowder synthesis, surface modification etc from experimental and numerical approaches. His paper concerning thermal plasma simulation with non-equilibrium effects was selected as a leading paper in Journal of Physics D: Applied Physics in 2004.

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