Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

**A Numerical Study on Nanoparticle Synthesis in Pulse-Modulated Induction Thermal Plasmas with Intermittent Feedstock Powder Feeding by Method of Moment** YASUNORI TANAKA, KAZUKI ONDA, KEITA AKASHI, RYUDAI FURUKAWA, YUSUKE NAKANO, TATSUO ISHIJIMA, Kanazawa University, SHIORI SUEYASU, SHU WATANABE, KEITARO NAKAMURA, Nisshin Seifun Group Inc., KU-NISSHIN COLLABORATION — We have developed a unique and original method for a high-production rate(˜500 g/h@20 kW) nanoparticle synthesis using pulse-modulated induction thermal plasmas with time-controlled feedstock feeding (PMITP+TCFF). The modulated coil current generates an extremely high-temperature thermal plasma in on-time, while a relatively low-temperature plasma in off-time. Feedstock particles are intermittently injected during only on-time synchronously to the PMITP for its efficient evaporation. This evaporated material is cooled down rapidly to promote nucleation of nanoparticles during off-time. In this report, a numerical model was developed for complex phenomena in PMITP+TCFF method; A transient electromagnetic thermofluid model was adopted for PMITP with feedstock particle dynamics. Two-way interactions between PMITP and feedstock particles including exchange in mass, momentum and energy were taken into account. For nanoparticle synthesis, the method of moment (MOM) was used to solve general dynamics equation (GDE) for aerosol considering homogeneous nucleation, heterogeneous condensation. As a result, it was found that the coil current modulation can generate modulated thermofluid field by strong induced gas flow, which can promote nucleation of nanoparticles.

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Date submitted: 10 Jun 2020 Electronic form version 1.4