Abstract Submitted
for the GEC05 Meeting of
The American Physical Society

Synthesis of nanoparticles in microplasma reactor TOMOHIRO NOZAKI, Tokyo Institute of Technology, DAISUKE ASAHI, KEN OKAZAKI, KENJI SASAKI — Synthesis of silicon-based nanoparticle has been studied in capacitively coupled VHF (144 MHz) microplasma reactor. A mixture of He/H_2/TEOS(Tetraethoxysilane) was processes in a 470 μm capillary tube. The process starts with the creation of supersaturated radical condition, followed by homogeneous nucleation, cluster formation and/or particle growth, and annealing including aggregation of particles. The proposed microplasma reactor has several advantages over these processes: (1) Microplasma under high frequency operation easily provides supersaturated environment regardless of thermodynamic equilibrium (Ne$\sim 4\times 10^{15} cc^{-1}$ at T_{rot} $\sim$1800K), (2) Micrometer scale reactor equalizes radical density and temperature, realizing uniform nucleation, (3) Charged particles prevent aggregation, (4) Particle synthesis due to consecutive reaction is easily optimized with short-residence time reactor ($\sim$ μs). Optimum gas mixture such as He/1000sccm, H_2/1sccm, and TEOS/(less than 100 ppm) deposited 50 nm particles on a substrate. Detailed analysis of those particles is now being conducted. * This work has been supported by the Grants-in-Aid for Scientific Research on the Priority Area of Microplasmas from the Japanese Ministry of Education, Culture, Sports, Science and Technology.

Tomohiro Nozaki
Tokyo Institute of Technology

Date submitted: 13 Jun 2005 Electronic form version 1.4