Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Synthesis of magnetic nanoparticles by atmospheric-pressure plasma electrolysis and observation of liquid flow induced by plasma NAOKI SHIRAI, TAKETO YOSHIDA, TAKUYA AOKI, SATOSHI UCHIDA, FUMIYOSHI TOCHIKUBO, Tokyo Metropolitan University — For the synthesis of magnetic metal NPs (nanoparticles), we used the electrolysis combined with atmospheric-pressure plasma. Plasma irradiated positive ions or electron to the solution surface; it worked as electrode of electrolysis. In the case of using aqueous solutions of FeCl2, magnetic NPs were synthesized at plasma-liquid interface when electron was irradiated to liquid surface. The plasma was generated in a miniature helium gas flow surrounded by a shielding gas flow controlling the gas condition around the plasma. The condition of magnetic NPs synthesis depended on the shielding gas species of plasma. In the case of using Ar or N2 shielding gas, magnetic NPs were synthesized. On the other hand, in the case of using O2 shielding gas or without shielding gas, magnetic NPs were not synthesized. To synthesize NPs without chemicals such as FeCl2 solutions, we use plasma electrolysis with iron electrode which is immersed in liquid. When plasma electrolysis was operated, iron electrode eluted to Fe cation and it becomes magnetic NPs at plasma-liquid interface. By using this method much of Fe3O4 is synthesized. In addition, we investigated liquid flow of plasma electrolysis by using Schlieren visualization. Liquid flow was observed when plasma electrolysis was operated.

Naoki Shirai
Tokyo Metropolitan University

Date submitted: 19 Jun 2015 Electronic form version 1.4