Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Nanoparticle network growth in arc generated fireballs of silicon powder TSUYOHITO ITO, Osaka University, MARK CAPPELLI, Stanford University, OSAKA UNIVERSITY COLLABORATION, STANFORD UNIVERSITY COLLABORATION — Recently we observed buoyant fireballs by arc igniting silicon that drift in air for several seconds and postulated that the low aggregate density was attributed to the formation of a network of nanoparticles that must completely surround the burning silicon core, trapping the heated vapor generated as a result of particle combustion [Ito et al, Phys Rev E 80, 067401 (2009)]. In this study, we describe the capturing of several of these fireballs in flight, and have confirmed this nanostructure by scanning electron microscopy. The nanoparticle network is found to have an unusually high porosity ($> 99\%$). It is also found that the overall nanoparticle network size is determined by the size of the molten silicon core, independent of the time of capture. In other words, the size and structure of the surrounding nanoparticle network seems to be limited by the vapor flux from the molten silicon core, which is determined by its surface area (size). Further details of both the experiments and analysis will be presented at the conference.

Mark Cappelli
Stanford University

Date submitted: 21 Jul 2011 Electronic form version 1.4