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Atmospheric Pressure Low Temperature Plasma Jet Sintering of Silver Nanoparticles[1] NAZLI TURAN, MORTAZA SAEIDI-JAVASH , YANLIANG ZHANG, DAVID GO, University of Notre Dame — Recent developments in additive manufacturing have enabled printing of colloidal nanoparticles for diverse technologies, including energy conversion and storage, sensing, and electronics. However, the printed materials must be then processed at a high temperature or in a high pressure environment in order to be sintered and become conductive. Conventional plasma sintering methods require high temperature and pressure (e.g., spark plasma sintering) or low pressure (e.g., radio frequency plasmas). These extreme requirements are not conducive for high throughput processing or additive manufacturing on substrates that have relatively low melting temperatures. Here, a plasma jet sintering process is implemented at atmospheric pressure and room temperature, enabling printing on plastics and flexible materials and sintering aerosol jet-printed silver nanoparticles. The electrical conductivity of the sintered silver films is measured as a function of plasma exposure and correlated with plasma properties via electrical measurements and time-resolved optical emission spectroscopy (OES) and the thermal conditions via infrared (IR) imaging. Results show that sintering can be achieved using an argon plasma jet in a nitrogen environment with the substrate maintained below 30C.

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