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Plasma-polymerized methyl methacrylate via intense and highly energetic atmospheric pressure micro-plasma for bio-medical applications CHOON-SANG PARK, JOHN BALLATO, SUNG-O KIM, Center for Optical Materials Science and Engineering Technologies, Clemson University, CLEMSON UNIVERSITY TEAM — Poly (methyl methacrylate), PMMA, has been widely used as a biocompatible material in bone cement, dental fillings, and many other bio-related applications. Vacuum plasmas and radio frequency (RF) atmospheric plasmas are the most common methods for depositing plasma-derived thin films and nanoparticles. However, the necessary equipment is difficult to operate and maintain as well as being large and expensive. Here, we report the use of a novel intense and highly energetic atmospheric pressure plasma jet array using direct plasma jet-to-jet coupling effects to deposit high quality plasma-polymerized MMA (PPMMA) for bio-medical applications. The newly proposed atmospheric pressure micro-plasma jet array device can generate the intense plasma mode with a strong plasma emission and high plasma particle energy. PPMMA was successfully deposited on a variety of substrates and characterized by SEM, AFM, and FT-IR. The micro-plasma jet is obtained at a sinusoidal voltage with a peak value of 30 kV and frequency of 35 kHz. Argon gas was employed as the discharge gas for plasma generation and its flow rate was in the range of 2230 sccm, Methyl methacrylate (MMA) monomer was vaporized by means of a glass bubbler which was supplied by argon gas with flow rates in the range of 268 sccm from room temperature to 400°C. The deposited PPMMA thin films were flexible, transparent, thin, and strong on metal substrates.

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