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Diamondoid synthesis by nanosecond pulsed microplasmas generated in He at atmospheric pressure[1] SVEN STAUSS, TOMOKI SHIZUNO, FUMITO OSHIMA, DAVID Z. PAI, KAZUO TERASHIMA, Department of Advanced Materials Science, The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa, Chiba 277-8561 Japan — Diamondoids are sp^3 hybridized carbon nanomaterials that possess interesting properties making them attractive for biotechnology, medicine, and opto- and nanoelectronics. So far, larger diamondoids have been synthesized using the smallest diamondoid (adamantane) as a precursor. For this electric discharges and pulsed laser plasmas generated in supercritical fluids, and hot filament chemical vapor deposition have been used, but these methods are difficult to realize or very time-consuming. We have developed a more convenient approach where diamondoids are synthesized by high-voltage nanosecond pulsed microplasmas (voltage 15 kV_{p-p}, frequency 1 Hz, pulse width 10 ns) generated in He at atmospheric pressure using point-to-plane tungsten electrodes. Adamantane was used as a precursor, and synthesis was conducted for 10^5 pulses at gas temperatures of 297, 373 and 473 K. Energy dispersive X-ray and micro-Raman spectroscopy were conducted to determine the composition of the products, and gas chromatography - mass spectra indicated the formation of diamantane. It was found that synthesis is more efficient at room temperature than at higher temperatures, and time-resolved optical emission spectroscopy suggest that the chemical reactions take place in the afterglow.

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