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Study of nano-structured electron sources using photoemission electron microscope

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Nanostructured electron sources exhibiting simultaneous spatio-temporal confinement to nanometer and femtosecond level along with a low emittance can be used for developing future ordered electron sources to generate unprecedented electron beam brightness and can revolutionize stroboscopic ultrafast electron scattering and steady-state electron microscopy applications. In addition, high current density electron beams generated from nanostructured electron sources can be used for applications that include nanoelectronics and dielectric laser accelerators. In this work, we report our efforts to develop and characterize two kinds of nanostructured electron sources: (i) nitrogen incorporated ultrananocrystalline diamond [(N)UNCD] tips and (ii) plasmonic Archimedean spiral focusing lens. We demonstrate the ability to fabricate these cathodes and characterize them using a photoemission electron microscope under femtosecond laser illumination thereby demonstrating the ability of these structures to be used for next generation electron sources.

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Footnotes

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