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Synthesis of photoluminescent nanoparticles in a continuous flow non-thermal plasma reactor[1] LORENZO MANGOLINI, ELIJAH THIMSEN, UWE KORTSHAGEN, Department of Mechanical Engineering, University of Minnesota — Silicon nanoparticles small enough to show quantum confinement effects exhibit intense room temperature luminescence and might find applications in novel light emitting devices, in microelectronics, and as biological tagging agents. A new approach for the synthesis of luminescent silicon nanocrystals is presented. Silicon nanoparticles with an average size below 5 nm are produced in a continuous flow non-thermal plasma reactor. The reactor consists of a simple 3/8" quartz tube through which an Argon/Silane mixture is flown. RF power is fed into the system through two ring electrodes. The produced particles are crystalline and show bright red-orange photoluminescence. The influence of the experimental parameters and plasma properties on the produced material is discussed. The system is capable of producing several tens of milligrams per hour of luminescent powder. The process has also been modified to synthesize amorphous hydrogenated carbon nanoparticles, which show efficient luminescence in the blue-green range. These particles are synthesized in an Argon/Methane discharge. The photoluminescence and quantum yield efficiency have been characterized with respect of the experimental conditions.

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