Plasma Engineering for Nano-Materials

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A high temperature and a low temperature plasma process technologies were developed and demonstrated for synthesis, hybrid formation, surface treatment and CVD engineering of nano powder. RF thermal plasma is used for synthesis of spherical nano particles in a diameter ranged from 10 nm to 100 nm. A variety of nano particules such as Si, Ni, has been synthesized. The diameter of the nano-particles can be controlled by RF plasma power, pressure, gas flow rate and raw material feed rate. A modified RF thermal plasma also produces nano hybrid materials with graphene. Hemispherical nano-materials such as Ag, Ni, Si, SiO2, Al2O3, size ranged from 30 to 100 nm, has been grown on graphene nanoplatelet surface. The coverage ranged from 0.1 to 0.7 has been achieved uniformly over the graphene surface. Low temperature AC plasma is developed for surface modification of nano-powder. In order to have a three dimensional and lengthy plasma treatment, a spiral type of reactor has been developed. A similar plasma reactor has been modified for nano plasma CVD process. The reactor can be heated with halogen lamp.

Keywords: RF Thermal Plasma, Nano material, Plasma nano sizing, Plasma spheroidization, Plasma nano compounding

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