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「機械システム・イノベーション」

GMSI

最先端融合科学イノベーション
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東京大学
THE UNIVERSITY OF TOKYO

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Nanostructure Engineering using Microplasmas: synthesis and applications

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Abstract:
Microplasmas are a special class of electrical discharges formed in geometries where at least one dimension is less than 1 mm. As a result of their unique scaling, microplasmas operate stably at atmospheric pressure and contain large concentrations of energetic electrons (1-10 eV). These properties are attractive for a range of nanomaterials synthesis and nanostructure engineering such as metal nanostructures and carbon-based materials [1-3].

In this presentation, I will discuss these topics in detail, highlighting the advantages of microplasma-based systems for the synthesis of well-defined nanomaterials. These experiments will aid in the rational design and fabrication of nanomaterials and may also have significant impact in emerging applications. Recently, we found that the energetic species including radicals, ions and electrons generated in the microplasmas were capable of initiating electrochemical-assisted reactions for the nucleation and growth of graphene quantum dots [4]. Moreover we develop a simple synthesis of metal nanoparticles/graphene composites using a unique atmospheric-pressure microplasma-assisted electrochemical method. Systematic micro Raman study indicates that the as-produced AgNP/graphene composites show exceptional SERS performance [5].

Reference:
[1] W-H. Chiang and R. M. Sankaran, Adv. Mater. 20, 4857 (2008)
[2] W-H. Chiang and R. M. Sankaran, Nature Mater. 8, 882 (2009)
[3] W-H. Chiang et al., J. Mater. Chem. A 4, 7624 (2016)
[4] W-H. Chiang et al., MRS Fall Meeting (2016)
[5] W-H. Chiang et al., MRS Fall Meeting (2016).

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