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Authors: Jie Han, Minggui Wang, Yimin Hu, Chuanqiang Zhou, Rong Guo

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Conducting Polymer-Noble Metal Nanoparticle Hybrids: Synthesis, Mechanism and Application

Jie Han*, Minggui Wang, Yimin Hu, Chuanqiang Zhou, Rong Guo*

School of Chemistry and Chemical Engineering, Yangzhou University, Yangzhou, 225002, Jiangsu, P. R. China

***Corresponding authors:** hanjie@yzu.edu.cn; guorong@yzu.edu.cn; Fax: +86 514 8797 5568; Tel: +86 514 8797 5590

ABSTRACT

Recent research has established growing research interest in subject of conducting polymer (CP)-based hybrids due to their novel properties and potential applications in diverse fields. The incorporation of CPs with other materials can produce new hybrids showing distinct properties that are not observed in the individual components. Among numerous CP-based hybrids, CP and noble metal nanoparticle (NMNP) hybrids have attracted the most intensive attention in the past few years. The numerous functional groups and tunable chemical structures through redox in the main chains of CPs, make them as ideal supporters for NMNPs. The compact interactions and synergistic effects between CPs and NMNPs contribute to the increased performances in diverse applications. The purpose of this review focuses on state-of-the-art synthetic strategies, mechanisms and applications involved in CP-NMNP hybrids. Herein, CPs used are polyaniline (PANI), polypyrrole (PPY), polythiophene (PTH) and their derivatives; while NMNPs mainly refer to Au, Ag, Pt and Pd nanoparticles. Specifically, the topics include: 1) strategies and mechanisms involved in the synthesis of CP-NMNP hybrids; 2) potential applications of CP-NMNP hybrids in fields of catalysis, sensor, surface-enhanced Roman scattering (SERS), device and others. Finally, prospects and challenges for making advanced CP-NMNP hybrids are discussed.

Keywords: Conducting polymer; Polyaniline; Noble metal nanoparticle; Au, Hybrid; Catalysis; Sensor