Mini Review

Peptide Based Noble Metal Nanomaterials for Oxygen Reduction Reaction: A Review

Meng Zong^{1,*}, Zhaoqing Ding², Wei He¹, Jing Luo³ and Zhenghua Tang^{2,4,*}

¹ Chongqing Chemical Industry Vocational College, Chongqing, 401220, P. R. China.

² Guangzhou Key Laboratory for Surface Chemistry of Energy Materials, New Energy Research Institute, School of Environment and Energy, South China University of Technology, Guangzhou Higher Education Mega Centre, Guangzhou, 510006, China.

³ Chongqing University of Science and Technology, Chongqing, 401331, P. R. China.

⁴ Guangdong Engineering and Technology Research Center for Surface Chemistry of Energy Materials, School of Environment and Energy, South China University of Technology, Guangzhou Higher Education Mega Centre, Guangzhou, Guangdong, 510006, P. R. China

*E-mail: ahzmeng@126.com, zhht@scut.edu.cn

doi: 10.20964/2020.03.50

Received: 30 October 2019 / Accepted: 4 January 2020 / Published: 10 February 2020

Green energy devices including proton exchange membrane fuel cells (PEMFCs) and rechargeable metal air batteries (RMABs), play a significant role in ameliorating global energy scarcity and severe environment pollution issues. Unfortunately, the sluggish oxygen reduction reaction (ORR) occurring at the cathode restrains the deployment and advancement of PEMFCs and RMABs. Commercial Pt/C catalyst embraces excellent ORR performance but suffers from high cost, limited platinum reserve, as well as undesirable stability and durability. Recently, peptide-based noble metal nanomaterials with distinguished activity and robust durability have been emerging as a new type of ORR catalyst, as the preparation of such catalyst is environmentally friendly, and peptide can manipulate the physical, chemical and electronic properties of the catalyst with desirable functionalities. In this review, the basic principle and mechanism regarding ORR are firstly introduced and discussed, along with the recent progresses of peptide-based nanomaterials. Afterwards, we systematically summarize the achievements regarding employing peptide as template to prepare single noble metal, alloyed bimetallic, and core-shell bimetallic nanomaterials for achieving improved ORR activity and stability. In the end, the ascendancies, challenges and perspectives in this flourishing realm will be expounded, with an emphasis on the great potentials and opportunities to engineer peptide-based noble metal nanomaterials as high-efficiency and durable catalysts for ORR and other electrochemical energy applications.

Keywords: Peptide sequence; Noble metal nanomaterials; Oxygen reduction reaction; Proton exchange membrane fuel cell; Rechargeable metal-air batteries

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).