Improving the Rate Performance of Manganese Dioxide by Doping with Cu^{2+} , Co^{2+} and Ni^{2+} ions

You Yang¹, Xiaobing Huang², Yuqing Yang¹, Cailin Wu¹, Ben Lei¹, Qirong Peng¹, Guoping Wang^{1,*}

¹ College of Chemical Engineering, University of South China, Hengyang 421001, China

² College of Chemistry and Chemical Engineering, Hunan University of Arts and Science, Changde 415000, China

*E-mail: wgpcd@aliyun.com

doi: 10.20964/2019.04.30

Received: 1 December 2018 / Accepted: 28 January 2019 / Published: 10 March 2019

Metal-doped MnO_2 has been successfully synthesized via chemical precipitation method. Interestingly, doping can increase not only ion conductivity but also intrinsic electron conductivity. By doping, the particle size of MnO_2 decreases, relatively appropriate pore size distribution is obtained, and physically and chemically bound water content increases, all of which contribute to ion conductivity. Meanwhile, doping has induced some defects in MnO_2 crystal, increasing the hole concentration and then intrinsic electron conductivity. As the result, metal-doped MnO_2 displays better rate performance than the un-doped. Especially, nickel-doped MnO_2 exhibits the best rate behavior. Even at 8 A g^{-1} , nickel-doped MnO_2 still has a specific capacitance as high as 234.0 F g^{-1} , larger than that of the un-doped obtained at 1 A g^{-1} (only 173.6 F g^{-1}). In conclusion, doping is a useful way for improving the rate performance of MnO_2 .

Keywords: Manganese dioxide, Metal doping, Supercapacitor, Rate performance

[FULL TEXT](#)

© 2019 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/>).