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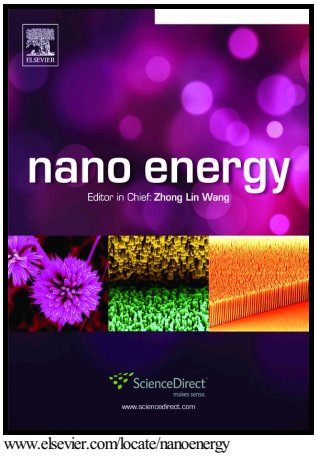

www.elsevier.com/locate/nanoenergy

PII: S2211-2855(18)30181-2
DOI: https://doi.org/10.1016/j.nanoen.2018.03.041
Reference: NANOEN2589

To appear in: *Nano Energy*

Received date: 23 November 2017
Revised date: 13 March 2018
Accepted date: 13 March 2018

Cite this article as: Su-jin Kim, Seung-Cheol Lee, Chongmok Lee, Myung Hwa Kim and Youngmi Lee, Evolution of silver to a better electrocatalyst: Water-assisted oxygen reduction reaction at silver chloride nanowires in alkaline solution, *Nano Energy,* https://doi.org/10.1016/j.nanoen.2018.03.041

Evolution of silver to a better electrocatalyst: Water-assisted oxygen reduction reaction at silver chloride nanowires in alkaline solution

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Abstract

Oxygen reduction reaction (ORR) is of great interest in various areas, including energy conversion. This paper presents the simple synthesis and characterization of one-dimensional silver halides nanowires (AgClNW and AgBrNW) as an electrocatalyst for ORR in alkaline media, as well as an investigation of the ORR pathway at AgCl. AgClNW and AgBrNW were prepared via a galvanic replacement reaction (GRR) between silver nanowires (AgNW) and a halide precursor. AgClNW exhibited excellent ORR catalytic activity that was comparable to or better than that for commercial Pt (20 wt% Pt loading on Vulcan carbon), demonstrating potential to replace Pt-based catalysts. A scanning electrochemical microscopy (SECM) analysis supports the existence of an associative ORR pathway at AgCl, and first-principles density functional theory (DFT) calculations suggest that the high ORR activity of AgCl is possibly attributed to the up-shifted Ag d-band center energy in AgCl as well as the assistance of adsorbed water molecules.

Graphical abstract

Silver chloride nanowires show an excellent electrocatalytic activity for oxygen reduction reaction via water assistance.