Fine-tuning the activity of oxygen evolution catalysts - DTU Orbit (18/12/2018)

Water splitting is hindered by the sluggish kinetics of the oxygen evolution reaction (OER). The choice of materials for this reaction in acid is limited to the platinum group metals; high loading required of these scarce and expensive elements severely limit the scalability of such technology. Ruthenium oxide is among the best catalysts for OER, however the reported activity and stability can vary tremendously depending on the preparation conditions and pre-treatment. Herein, we investigate the effect of oxidation treatment on mass-selected Ru nanoparticles in the size range between 2 and 10 nm. The effect of two distinct oxidation pre-treatments on the activity and stability have been investigated: (1) thermal oxidation; and (2) oxidation with an oxygen plasma under vacuum. We report that activity and stability can be tuned by using different oxidation pre-treatments. Thermally oxidized particles exhibited the lowest activity, although over an order of magnitude higher than the state of the art, and the highest stability. Plasma-treated particles showed intermediate performance between as-deposited and thermally oxidized NPs.

General information
State: Published
Organisations: Department of Physics, Experimental Surface and Nanomaterials Physics, Center for Electron Nanoscopy
Number of pages: 8
Pages: 57-64
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Catalysis Today
Volume: 262
ISSN (Print): 0920-5861
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 4.55 SJR 1.347 SNIP 1.329
Web of Science (2017): Impact factor 4.667
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.26 SJR 1.322 SNIP 1.369
Web of Science (2016): Impact factor 4.636
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 4 SJR 1.335 SNIP 1.403
Web of Science (2015): Impact factor 4.312
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.72 SJR 1.315 SNIP 1.453
Web of Science (2014): Impact factor 3.893
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.39 SJR 1.299 SNIP 1.415
Web of Science (2013): Impact factor 3.309
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.38 SJR 1.469 SNIP 1.422
Web of Science (2012): Impact factor 2.98
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 3.34 SJR 1.472 SNIP 1.562