High Specific and Mass Activity for the Oxygen Reduction Reaction for Thin Film Catalysts of Sputtered Pt3Y - DTU Orbit (07/12/2018)

Fuel cells have the potential to play an important role in sustainable energy systems, provided that catalysts with higher activity and stability are developed. In this work, it is found that thin alloy films of single-target cosputtered platinum-yttrium exhibit up to seven times higher specific activity (13.4 ± 0.4 mA cm⁻²) for the oxygen reduction reaction (ORR) than polycrystalline platinum, and up to one order of magnitude higher mass activity (3.5 ± 0.3 A mg⁻¹) than platinum nanoparticles. These alloys have the highest reported ORR activity for an as-deposited material, i.e., without any additional chemical or thermal treatment. The films show an improvement in stability over the same materials in nanoparticulate form. Physical characterization shows that the thin films form a platinum overlayer supported on an underlying alloy. The high activity is likely related to compressive strain in that overlayer. As sputtering can be used to mass-produce fuel cell electrodes, the results open new possibilities for the preparation of platinum-rare earth metal alloy catalysts in commercial devices.

General information
State: Published
Organisations: Department of Physics, Experimental Surface and Nanomaterials Physics, Chalmers University of Technology
Number of pages: 9
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Advanced Materials Interfaces
Volume: 4
Issue number: 13
Article number: 1700311
ISSN (Print): 2196-7350
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 4.13 SJR 1.796 SNIP 0.785
Web of Science (2017): Impact factor 4.834
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.57 SJR 1.545 SNIP 0.876
Web of Science (2016): Impact factor 4.279
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.47 SJR 1.193 SNIP 0.668
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Web of Science (2014): Impact factor
BFI (2013): BFI-level 1
Original language: English
DOIs: 10.1002/admi.201700311
Source: FindIt
Source-ID: 2363404228
Research output: Research - peer-review › Journal article – Annual report year: 2017