

PO4002

Preparation of good adhered cobalt oxide films on stainless steel support by combination of reactive magnetron sputtering and electrochemical deposition

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Thin films of Co_3O_4 were deposited on stainless steel sieves by combination of reactive magnetron sputtering and electrochemical deposition. The films deposited by reactive RF magnetron sputtering or by reactive high-power impulse magnetron sputtering (HiPIMS) served both as interlayers for subsequent electrochemical deposition of cobalt oxide or as interlayer and layer on the top of the multilayer system ("sandwich"). Formation of Co_3O_4 after reactive magnetron sputtering as well as after heating of the electrochemically deposited product was confirmed by XRD. The surface structure was observed by SEM. The thin films deposited by the magnetron sputtering showed very good adhesion to the stainless steel surface. Coating of the stainless steel sieves with thin Co_3O_4 sputtering interlayers considerably improved also the adhesion of Co_3O_4 crystals deposited by electrochemical way; a major improvement of their adhesion was observed especially when HiPIMS interlayer was applied. The combined magnetron sputtering and electrochemical deposition of Co_3O_4 can be used for preparation of supported catalysts; therefore, the prepared materials were tested as catalysts in the total oxidation of ethanol.

Keywords

HiPIMS

sputtering

thin films

plasma deposition

catalysts