Investigating anodic electrodeposition of NiOOH towards implementation of NiO in optoelectronic devices.

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Electrodeposition of NiOOH is an attracting route toward nanosized films of NiO, a p-type semiconductor used in many advanced applications. In this talk, the deposition mechanism is thoroughly investigated aiming at the clarification of the deposition dynamics and the chemical nature of the deposit. In the potential range investigated the process is mass transport controlled and strongly overlaps with oxygen evolution reaction. A kinetic model to disentangle the two reactions is developed and validated, providing precious understanding for future exploitations of anodic electrodeposited NiO, especially in applications where a strict control on surface morphology and thickness on the nanoscale is mandatory. As a proof, perovskite solar cells employing electrodeposited NiO have been fabricated. We found that the performances are strongly dependent on the deposition potential, with the PCE increasing when going from 1.00 V to 1.10 V vs Ag/AgCl. The best efficiency obtained is 16.1%, due to a fill-factor of 78%. Notably, the electrodeposited layer outperformed the sol-gel spin-coated one, proving the effectiveness of electrosynthesis to achieve competitive selective contacts for perovskite photovoltaics.