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## Spherical Ni/NiO nanoparticles decorated on nanoporous carbon (NNC) as an active electrode material for urea and water oxidation reactions †

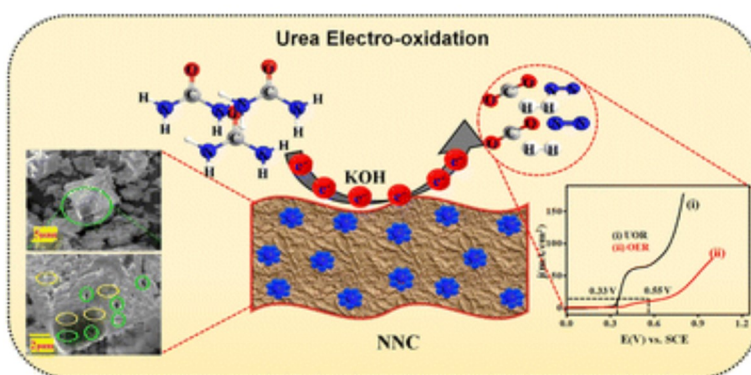


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### Abstract

Herein, we report a chemical method for scalable synthesis of spherical Ni/NiO nanoparticle-decorated nanoporous carbon (NNC) based electrocatalytic system using a simple and easy chemical method with ultra-high activity towards urea electrooxidation. Morphological analysis by scanning electron microscopy (SEM) and high-resolution transmission electron microscopy (HR-TEM) confirms the formation of Ni/NiO NPs on highly nanoporous carbon with an average size of ~50 nm. X-ray diffraction (XRD) confirms NNC with a face-centred cubic (FCC) crystal structure. Ni/NiO NPs intercalated with nanoporous carbon exhibited the best electrocatalytic performance towards urea oxidation with an ultra-low onset potential of ~0.33 V vs. SCE, and faster electrokinetic mechanism confirmed from Tafel slope (~45 mV dec<sup>-1</sup>), EIS  $R_{ct}$  (~6.98 Ω), and long term durability for 7 h at 10 mA cm<sup>-2</sup> with high CO poisoning tolerance. This work affords noble metal-free electrocatalysts for novel appliances and remarkable potential for urea determination, hydrogen generation, real-time water remediation, and energy conversion.



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