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One-pot synthesis of novel silver-polyaniline-polyvinylpyrrolidone electrocatalysts for efficient oxygen reduction reaction

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1 **One-pot synthesis of novel silver-polyaniline-polyvinylpyrrolidone electrocatalysts for**  
2 **efficient oxygen reduction reaction**

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11  
12 **ABSTRACT**

13 A facile and fast aqueous phase-based strategy to synthesize silver-polyaniline-  
14 polyvinylpyrrolidone (Ag-PANI-PVP) nanocomposites, via chemical oxidative  
15 polymerization method is presented. In the presence of polyvinylpyrrolidone (PVP), which  
16 has an accelerating effect on the oxidation of aniline with silver nitrate, Ag nanoparticles  
17 (AgNPs) were *in situ* generated in aqueous solution during simultaneous formation of  
18 polyaniline (PANI), without any additional reducing agent or complicated treatment. We have  
19 demonstrated synthesis of three stable Ag-PANI-PVP nanocomposites with different content,  
20 size, and morphology of Ag nanoparticles by varying the experimental parameters, such as pH  
21 and PVP concentration. As a result, this led to different Ag nanostructures (spherical and  
22 polyhedral NPs), and, consequently, different morphology of formed nanocomposites  
23 (granular and nanosheets). The physicochemical properties of nanocomposites were examined  
24 by using different analytical techniques (UV-Vis, TEM, FESEM, FT-IR, XRD, and Raman).  
25 It is found that optical properties, electrical conductivity and the content of Ag in the  
26 composites vary depending on the synthetic conditions. The electrocatalytic behavior of Ag-  
27 PANI-PVP nanocomposites was examined towards the oxygen reduction reaction in acidic  
28 and alkaline media. All tested nanocomposites showed high electrocatalytic activity, while the

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