

### Preparation of carbon-coated Ni nanoparticles via hydrogen-free spray pyrolysis

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In the recent years, Nickel nanoparticles have many potential applications such as photocopying, medical imaging, magnetic drug targeting and alternative conductor for Ag. Pure Ni nanoparticles are difficult to be prepared because their surface is very active and oxidizable. Thus, the surface of Ni nanoparticles is passivated with a protective agent when they are prepared by some solution-based synthesis. In gas-phase synthesis, the surface oxidation of nickel nanoparticles is inevitable. One method to obtain nickel nanoparticles without an oxidation layer is to cover nanoparticles with carbon shells. Then, the carbon shell effectively protects particles against oxidation and guarantees their stability in air and corrosive liquids. In this work, the spray pyrolysis was applied to prepare carbon-coated nickel nanoparticles. To obtain pure carbon/Ni nanoparticles without hydrogen, we modified the spray solution with some organics such as citric acid (CA) and sucrose. The effect of the CA content on the crystal phase of Ni nanoparticles was investigated. Also, the effectiveness of sucrose as a reduction agent was studied using scanning electron microscopy (SEM), X-ray diffraction (XRD), transmission electron microscope (TEM).