Synthesis of particles of ZnO:N by different doping methods and using urea as nitrogen precursor reagent

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ZnO is usually a n-type semiconductor and it's difficult to prepare p-type ZnO because p-type ZnO shows instability and often appears as n-type. Stable and reproducible materials containing ZnO p-n junctions are interesting for optoelectronic applications under low wavelengths. Nitrogen is usually chosen as dopant material for obtaining the p-type ZnO due the fact that it presents ionic radius and electronegativity similar to oxygen. Thus, the present work studies methods of synthesis of ZnO:N using urea as a nitrogen source. Four doping methods were evaluated by adding powdered urea in the particles of (1) crystalline ZnO and (2) amorphous ZnO; and in the resin of ZnO (3) before to the polymerizing agent (PA) and (4) after to the PA. The materials were heat-treated for 9 different conditions (400 ° C, 450 ° C and 500 ° C for 2 h, 12 h and 24 h) and characterized by XRD, CHN, Raman and XPS. I t was observed that the samples are in the *wurtzite* phase and it occurs the doping by molecular nitrogen. The samples with higher nitrogen content and lower organic material residue concentrations are those obtained by method 4.

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Reference: ZHANG, P. *et al.* The origin of the ~274 cm⁻¹ additional Raman mode induced by the incorporation of N dopants and a feasible route to achieve p-type ZnO:N thin films. Applied Surface Science, v. 327, p. 154-158, 2015.