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# Syntheses in Polyol Medium of Inorganic Oxides with Various Smart Optical Properties

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**Abstract :** At the interface of the studies performed by 3 Ph.D. students: Shian Guan (2017-2020), Marie Bourdin (2016-2019) and Isabelle Trenque (2012-2015), a single synthesis route: polyol-mediated process, was used with success for the preparation of different inorganic oxides. Both of these inorganic oxides were elaborated for their potential application as smart optical compounds. This synthesis route has allowed us to develop nanoparticles of zinc oxide, vanadium oxide or tungsten oxide. This route is with easy implementation, inexpensive and with large-scale production potentialities and leads to materials of high purity. The obtaining by this route of nanometric particles, however perfectly crystalline, has notably led to the possibility of doping these matrix materials with high doping ion concentrations (high solubility limits). Thus, Al3+ or Ga3+ doped-ZnO powder, with high doping rate in comparison with the literature, exhibits remarkable infrared absorption properties thanks to their high free carrier density. Note also that due to the narrow particle size distribution of the as-prepared nanometric doped-ZnO powder, the original correlation between crystallite size and unit-cell parameters have been established. Also, depending on the annealing atmosphere use to treat vanadium precursors, VO2, V2O3 or V2O5 oxides with thermochromic or electrochromic properties can be obtained without any impurity, despite the versatility of the oxidation state of vanadium. This is of more particular interest on vanadium dioxide, a relatively difficult-to-prepare oxide, whose first-order metal-insulator phase transition is widely explored in the literature for its thermochromic behavior (in smart windows with optimal thermal insulation). Finally, the reducing nature of the polyol solvents ensures the production of oxygen-deficient tungsten oxide, thus conferring to the nano-powders exotic colorimetric properties, as well as optimized photochromic and electrochromic behaviors.

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