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Study and applications of nanocrystalline powders of pure ZnO and doped with different oxides

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ZnO is known to have several interesting properties in various fields such as, piezoelectricity, electronics, optics and thermique. Such properties have, already, permitted the use of ZnO in the fabrication of several devices, especially in photovoltaic to manufacture transparent conductive electrodes, it is also used in solar cells, in optoelectronics, to manufacture blue emitting diodes. ZnO nanocrystalline has recently received a growing interest by many research groups, because of its wide range of functional properties. The applications of ZnO nanopowders include photocatalysis, nanoscale electronics, optoelectronics devices, the synthesis of methanol and polluting degradation, the manufacture of doped zinc oxide varistors used for the protection of electronic devices against voltage surge, etc. However, nanocrystalline semiconductors doping still present some difficulties, which need more efforts to be solved. This present work is a contribution to elucidate some of these problems. Pure and doped ZnO nanopowders can be prepared by many methods: thermal oxidation of metallic zinc, hydrothermal methods, plasma chemical synthesis, sol gel process, solar physical vapour deposition (SPVD) method and other techniques. In this lecture I will present results obtained by two distinct methods, the solar furnace and the sol gel, and I will focus on two applications: the photocatalysis and the manufacture of varistances.

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