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Synthesis of ZnO nanoparticles by Green process and investigation of their growth mechanism

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Abstract content
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ZnO is a wide band-gap semiconductor (~3.7 eV) at room temperature with a wurtzite crystal structure. It has attracted a significant interest worldwide above its initial potentiality as the ideal candidate for blue-UV light emitting diodes applications. Its multifunctionality as a transparent conducting oxide, effective piezoelectric and an efficient catalyst support among others, has made it as one of the most studied simple oxide in its nano form in the modern era.

Nano-scaled ZnO has been synthesized in a plethora of shapes. A variety of physical and chemical methodologies were used to synthesize undoped or doped ZnO. The physical methods necessitate high vacuum and relatively high temperatures. The chemical routes have been proved to be suitable in preparing various ZnO nanostructures due to their low growth temperature, cost effectiveness, and potential for mass production. The chemical route has the disadvantage of using chemical compounds/organic solvents as reducing agents which can be toxic as well as not easy in treatment of the waste end product. Green "physical-chemistry" approach which is based on using biogenic processes, reduces the pollution risk at source level and avoids waste rather than treat or clean it up after it is formed. More accurately, biogenic processes whereby the precursor of the nano-material to be synthesized is reduced/oxidized effectively via a biochemical interaction with the active compounds of the natural system, is gaining a global momentum. Plants' natural extracts mediated biosynthesis are used to synthesize at a certain extent oxide nanoparticles.

This contribution reports on the synthesis and the main physical properties of nano-scaled pure ZnO particles synthesized for the first time by a completely green chemistry process using Aspalathus Linearis's natural extract as an effective chemical reduction agent without addition of any acid or base standard component.

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