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Nanodiamonds/ZnO nanocomposite(s)-synthesis by ball milling technique, microstructural characterization and photoluminescence investigations

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Among the transparent conducting oxides (TCOs), Zinc oxide (ZnO) has been regarded an excellent candidate for applications in optoelectronic devices working in the blue and UV region of the sunlight. ZnO has maintained its superiority as TCO due to its wide and direct bandgap of about 3.37 eV, and also due to the excitation binding energy of 60 meV larger than many competing TCOs at room temperature. Albeit the extraordinary optoelectrical characteristics of ZnO many modifications are necessary to meet the demand of improved ZnO in various devices of practical applications. To vary the characteristics of ZnO, to meet the challenges, the microstructure is required to be tuned positively. One of the solutions is the formation of ZnO composites with new and versatile reinforcements. We report upon the synthesis of Nanodiamonds (ND)/ZnO nanocomposites using ball milling technique. The effect of NDs concentration upon the microstructrue and subsequently, upon the characteristics of ZnO has been investigated in detail. Besides, the effect upon the microstructure of ND/ZnO nanocomposites of other parameters has been studied. The syntheses of the ND/ZnO nanocomposites are monitored by using different characterization techniques including IR spectroscopy, powder X-rays diffraction (XRD), Scanning electron microscopy (SEM) and energy dispersive X-rays spectroscopy (EDX). The optoelectronic characteristics are studied by using ultraviolet-visible (UVV) and photoluminescence (PL) spectroscopy. It has been found that the band gap decreases with increasing concentration of the NDs. The red shift promises the use of ND/ZnO nanocomposite in solar cells, and photocatalysis operating in the visible range of the sunlight spectrum.

Biography

Hameed Ullah completed his PhD from the University of Saarland, Germany under the supervision of Prof. Dr. H.C. Michael Veith. He has worked upon the synthesis of single source molecular precursors which have been used in MOCVD process for preparation of nano thin films. After completion of PhD, he has joined Hazara University, Pakistan, as Assistant Professor. He has published numerous articles in peer reviewed journals and presented his research work in various international conferences in different countries. He has many M Phil and PhD students under supervision working upon the synthesis, characterization and applications of nanomaterials. He is serving as a reviewer of different international journals.

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