

Study of photocatalytic activity and properties of transition metal ions doped nanocrystalline TiO₂ prepared by sol-gel method

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We report the growth of [Fe, Co]_xTiO₂ (x=0.01, 0.02 & 0.04) nanocrystals prepared by Sol-Gel technique, followed by freeze-drying treatment at -30 °C temperature for 12 hrs. The obtained gel was thermally treated at different temperature like 200, 400, 600, 800 °C. The crystalline size of 4 to 40 nm is achieved. X-ray diffraction pattern of samples show anatase phases of TiO₂ up to 600 °C. At 800 °C, the phase is rutile. The diffraction peak at 25.22°, 25.49° and 25.6° observed from the XRD pattern of the Fe, Co doped TiO₂ shows that the main crystal phase is anatase, and the peak at 27.47° indicates the presence of the rutile phase. All the peaks in the XRD patterns of the sample calcined at 200 °C, 400 °C and 600 °C of TM doped TiO₂ can be designated to the anatase phase (most active phase) without any indication of other crystalline phases such as rutile or brookite. As a variant valence metal cation, Fe, Co ions can react with Ti⁴⁺ on the surface of TiO₂, and Ti⁴⁺ is reduced to Ti³⁺ which inhibits the transformation of anatase to rutile. It leads to the reduction in the oxygen vacancies on the TiO₂ surface and suppresses the crystallization of other phases by adsorbing onto the surface of the TiO₂ particles. The photocatalytic degradation of formaldehyde has been successfully demonstrated using a 250 V UV lamp with TM doped TiO₂ nano powder in a specific experimental setup. The degradation rate increases linearly with dopant content increases. This indicates that the photocatalytic reaction in this experiment was effected by dopant concentration. The results obtained in this research contribute to the understanding of binary doped transition metal ions in TiO₂ nanoparticles can lead the efforts of enhancing their environmental application. The magnetic susceptibility of the Fe, Co doped TiO₂ nanopowder increases with increase in doping concentration. Fe, Co doped TiO₂ exhibits para magnetism at room temperature.

Biography

Kirit Siddhapara under graduated in B.Sc. from P.T science collage of Veer Narmad South Gujarat University (2007), majoring in physics and maths and chemistry as subsidiary subject. He had completed Master of Science in Material Science (Nanotechnology) from The Maharaja Sayajirao University of Baroda, Vadodara, India by June 2009. At present, He was research scholar at S.V. National Institute of Technology Surat-395007, Since Jan-2010. He has three published paper in international journal like *Journal of crystal growth*.

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The quantum hall effect within the notion of peer cooper

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In this paper, we are interested by the study of the two-dimensional quantum mechanics of electrons in a magnetic field using the polar coordinate system (particles in a uniform magnetic field). Results were obtained concerning the definition of the orbital angular momentum of two-dimensional particle and its projection and statistics related to these particles.

On the other hand, we look for the fractional quantum hall effect from the concept of electron pairs using the notion of peer cooper. We determine the wave functions for the exact fundamental theory: the wave functions of two pair of electron are not other than the 'Laughlin' wave function but with two electrons in a near multiplicative hypergeometric function.

The merit of this work is not only to calculate the wave function, but in showing that the energy and the correlation function of this state are proportional to the distance between the electrons, moreover we show that the wave function that we find by the notion of peer cooper can be exactly expressed in terms of correlation functions of local vortex operator in the conformal field theory.

Biography

Kotbi Lakhdar is a doctorate student at theoreticale physics laboratory at University oran es-senia in Algeria. HE defened my magister thesis (a Diploma equivalent to Master Degree) on january 2011 on 'Fractional Quantum Hall Effect ' at laboratory of theoreticale physics at the age of 27 years. currently He prepare his doctorate thesis on 'Study of the symmetry breaking in magnetic systems'.

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