Electronic Supplementary Information

Corundum type indium oxide nanostructures: Ambient Pressure synthesis derived from InOOH, optical and photocatalytic properties.

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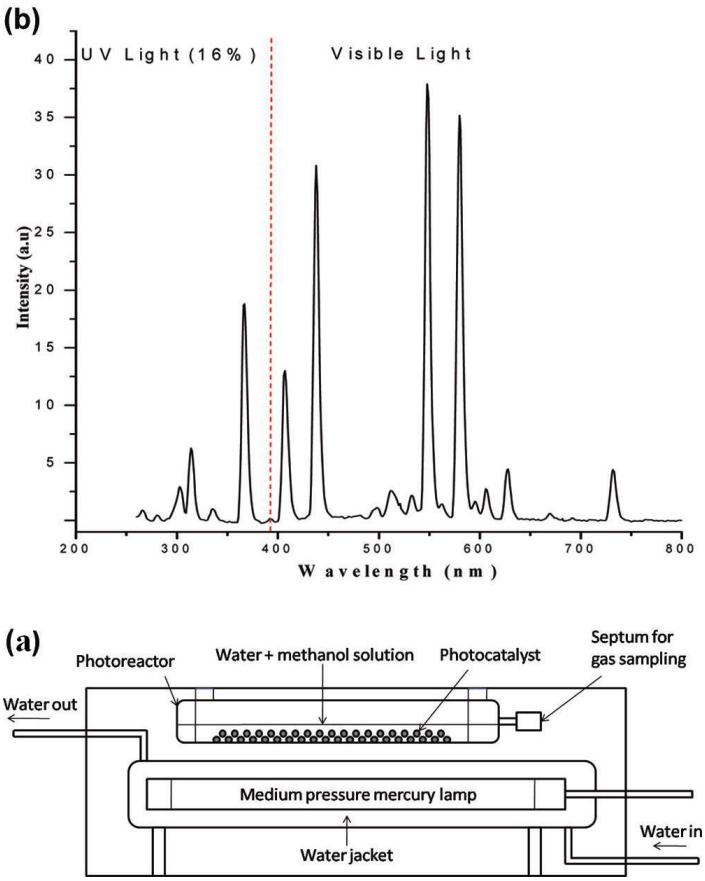

Fig. S1 Typical outer irradiation reaction assembly for evaluation of photoactivity of the samples under sunlight type irradiation with SAIC-UV-visible lamp (a) Schematic UV-Visible Irradiation with housing. (b) Emission spectra of SAIC UV-visible lamp.

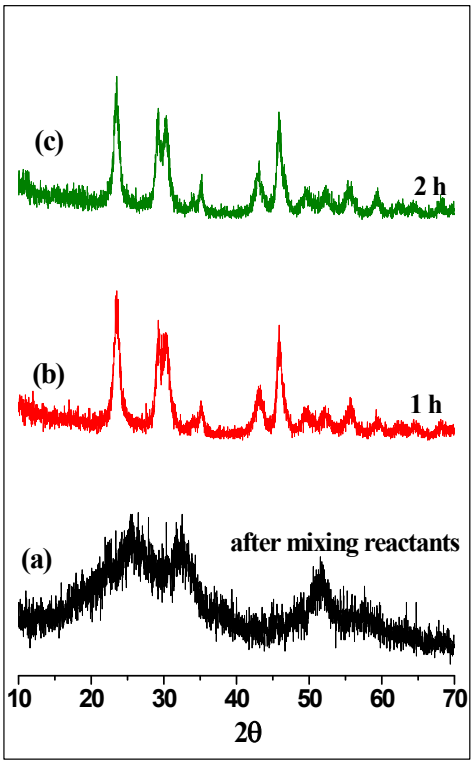

Fig. S2 XRD pattern of the intermediate sample isolated after (a) immediate mixing of reactancts; (b) 1h after the solvothermal reaction; (c) 2h after the reaction.

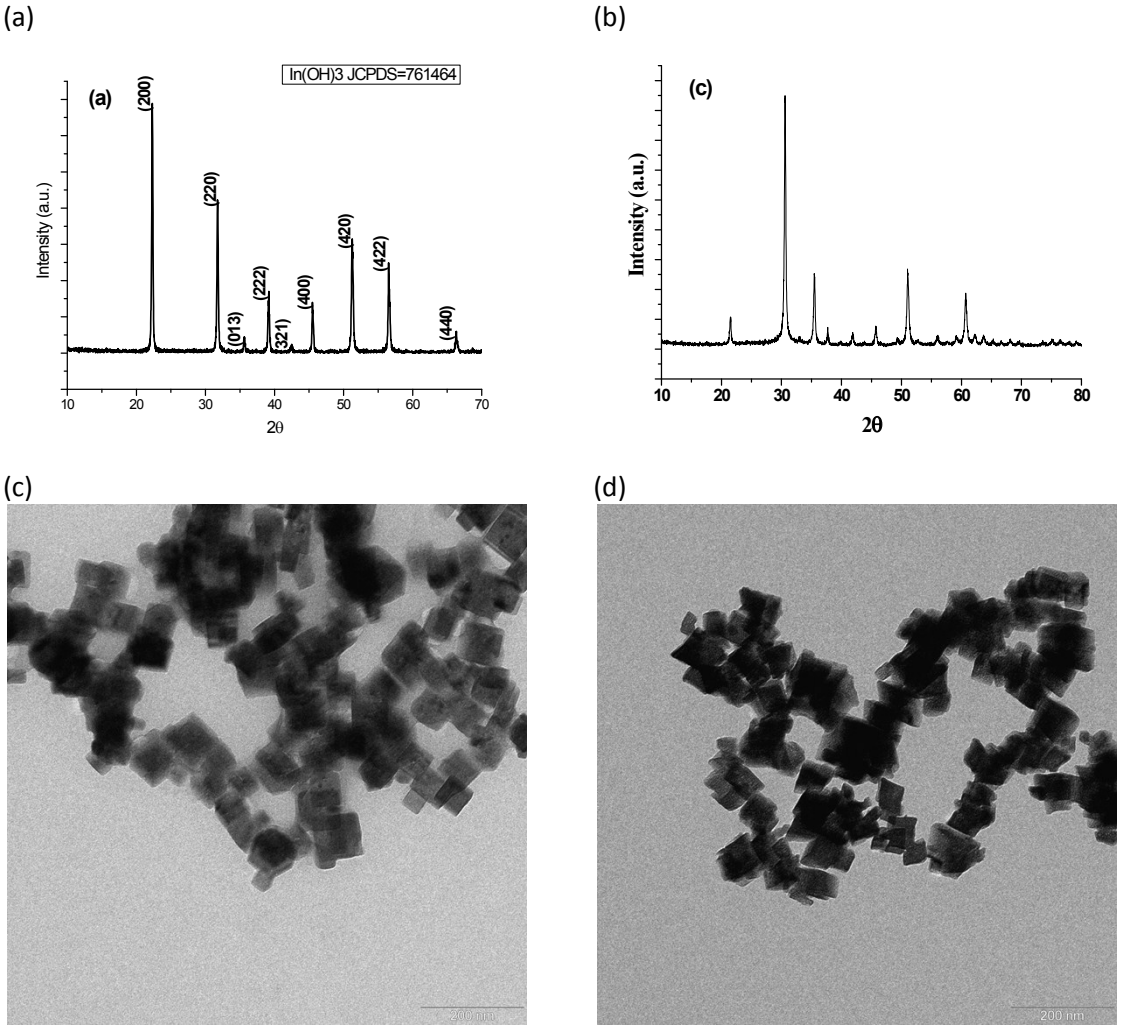

Fig. S3 (a) XRD pattern of $In(OH)_3$ nanoparticles, (b) XRD pattern of *c*-In_2O_3 nanoparticles obtained after thermal annealing of $In(OH)_3$ nanoparticles. (c) Low resolution TEM image of $In(OH)_3$ nanoparticles and (d) Low resolution TEM image of *c*-In_2O_3 nanoparticles obtained by thermal annealing of $In(OH)_3$ nanoparticles. Low magnification TEM micrographs for $In(OH)_3$ and *c*-In_2O_3 samples were recorded on a Libra 120 keV Electron Microscope (Carl Zeiss).

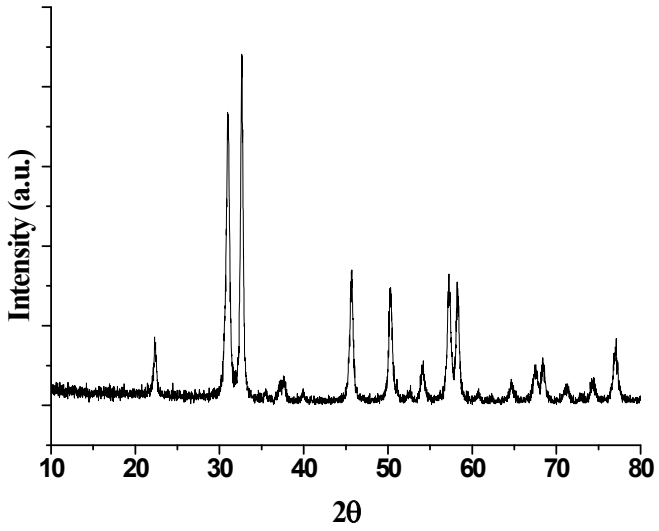

Fig. S4 XRD patterns of the residue obtained after DSC experiment. The sample was heated upto 675 ^{o}C and did not transform to *c*-In_2O_3

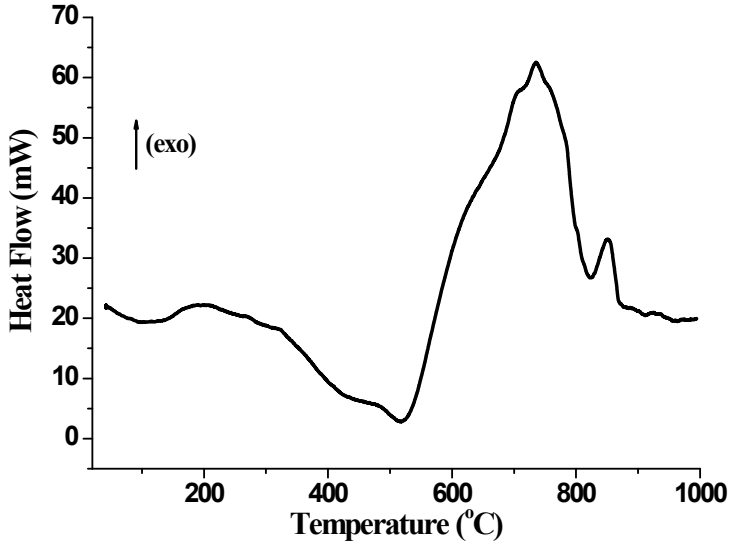

Fig. S5 The DTA measurement data on as prepared *rh*-In_2O_3 sample

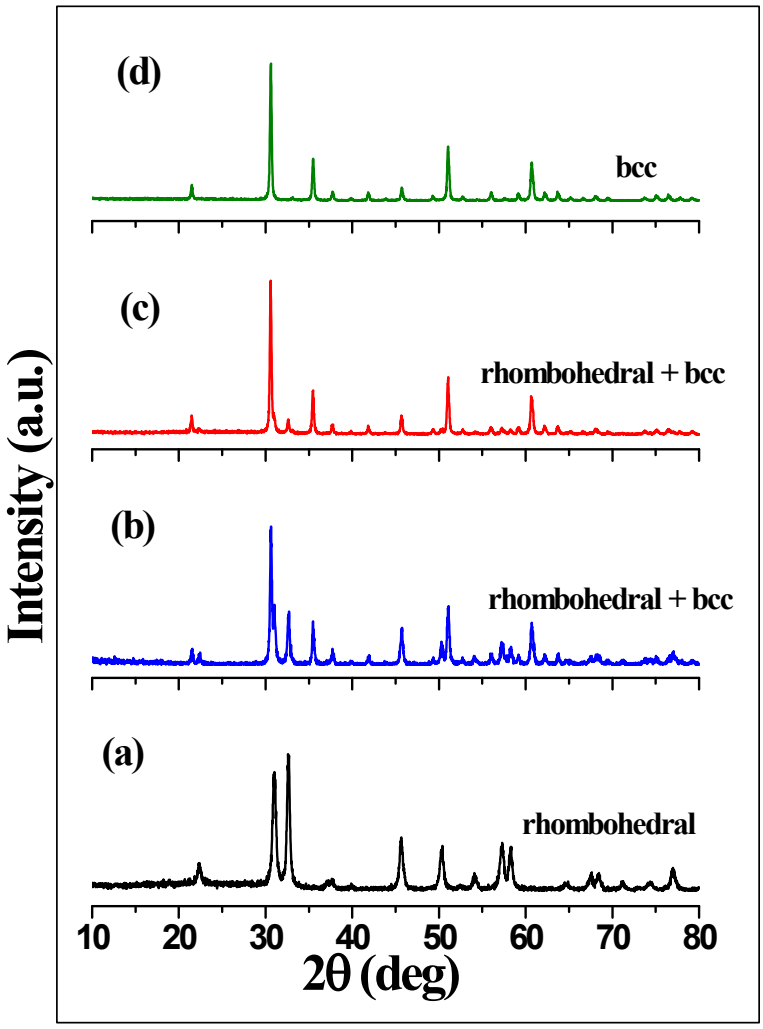

Fig. S6 XRD patterns for *rh*-In_2O_3 sample heated at 3 °C/min at temperature (a) 650 °C for 1 h, (b) 750 °C for 1h, (c) 800 °C for 1h and (d) 800 °C for 2h

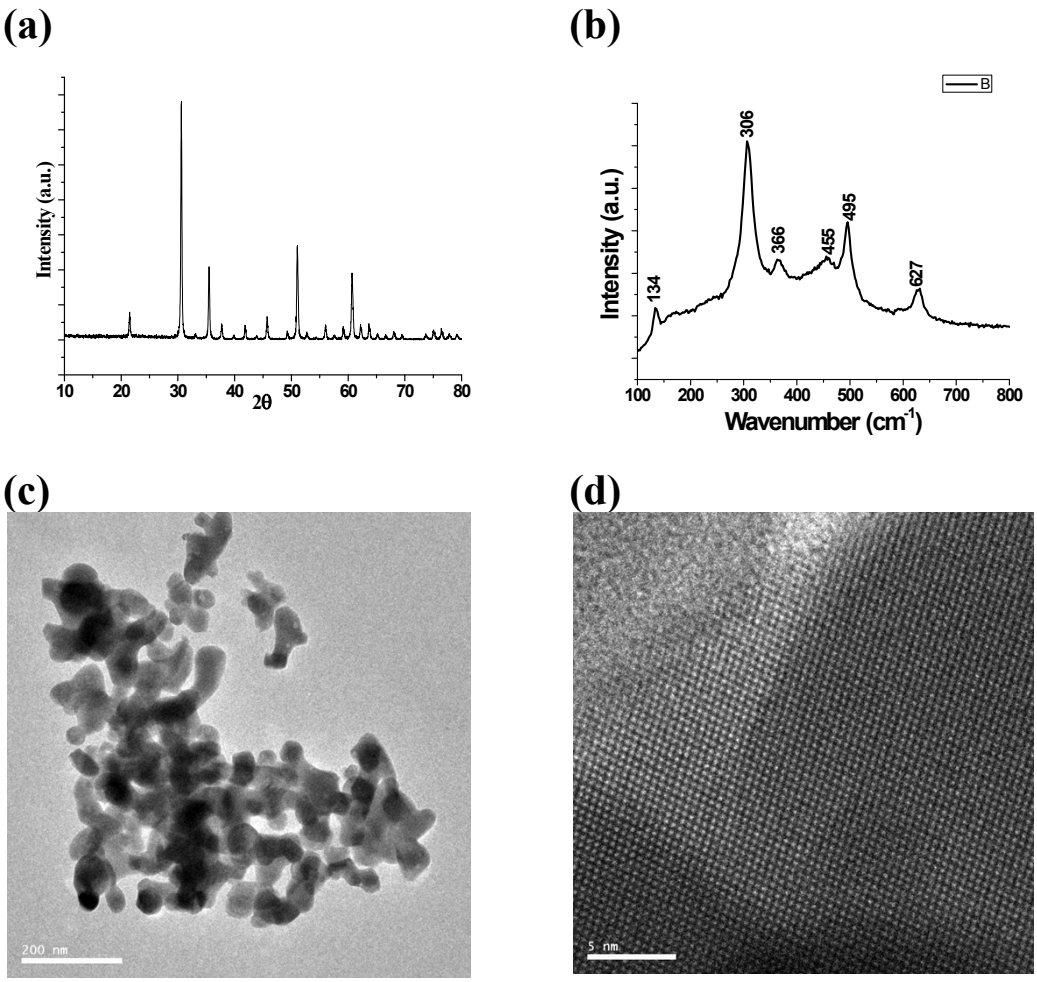

Fig. S7 (a) XRD pattern, (b) Room temperature Raman spectrum, (c) Low resolution TEM image and (d) High resolution TEM image of *c*-In_2O_3 nanoparticles obtained by thermal annealing of InOOH nanostructures.

The XRD pattern shown in Fig. S7(a) can be indexed to that of standard cubic bixbyite In_2O_3 (JCPDS no. 88-2160, space group *Ia*3). Figure S7(b) shows the room temperature Raman spectrum for the sample. Cubic In_2O_3 structure belongs to the I_a^3, T_h^7 space group. For the body-centered cubic In_2O_3, the vibrational modes are described as $4A_g$ (Raman active) + $4E_g$ (Raman active) + $14T_g$ (Raman active) + $5A_u$ (inactive for both Raman and IR) + $5E_u$ (inactive for Raman and IR) + $16T_u$ (IR active) [S1]. The observed Raman peaks located at 134, 306, 366, 455, 495, and 627 cm^{-1} can unambiguously be assigned to the phonon vibration modes of the bcc In_2O_3. Figure S67 (c) shows the low resolution TEM micrograph for the *c*-In_2O_3 nanoparticles. The formation of nearly spherical In_2O_3 nanoparticles with some agglomeration is clearly evident from the image. HRTEM image shown in Figure S7 (d) proves that the nanoparticles are highly crystalline.

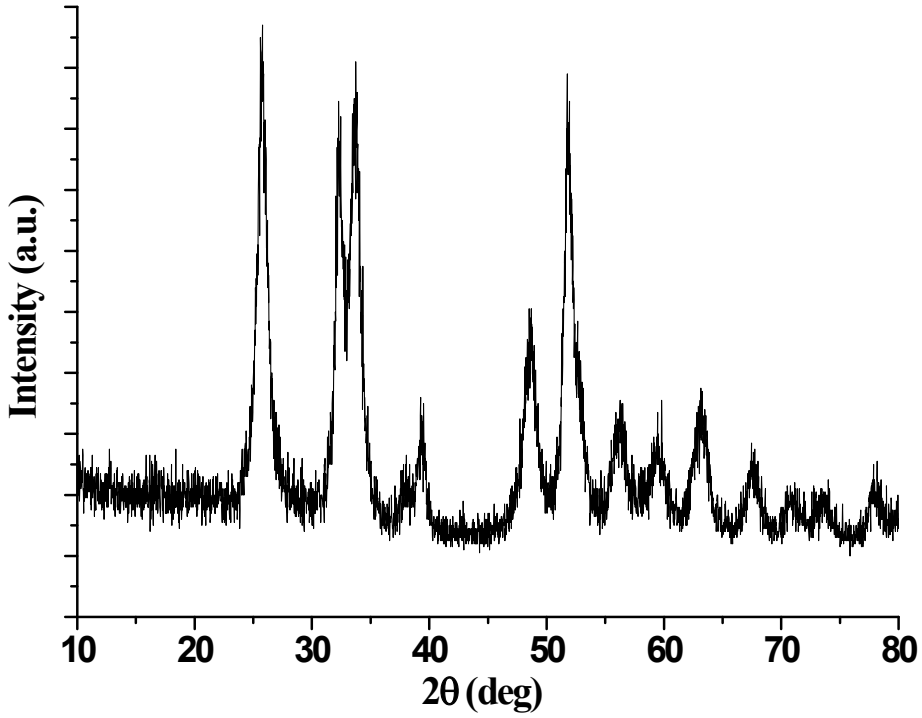

Fig. S8 XRD pattern of the residue isolated after photocatalytic experiment with InOOH nanoatructures.

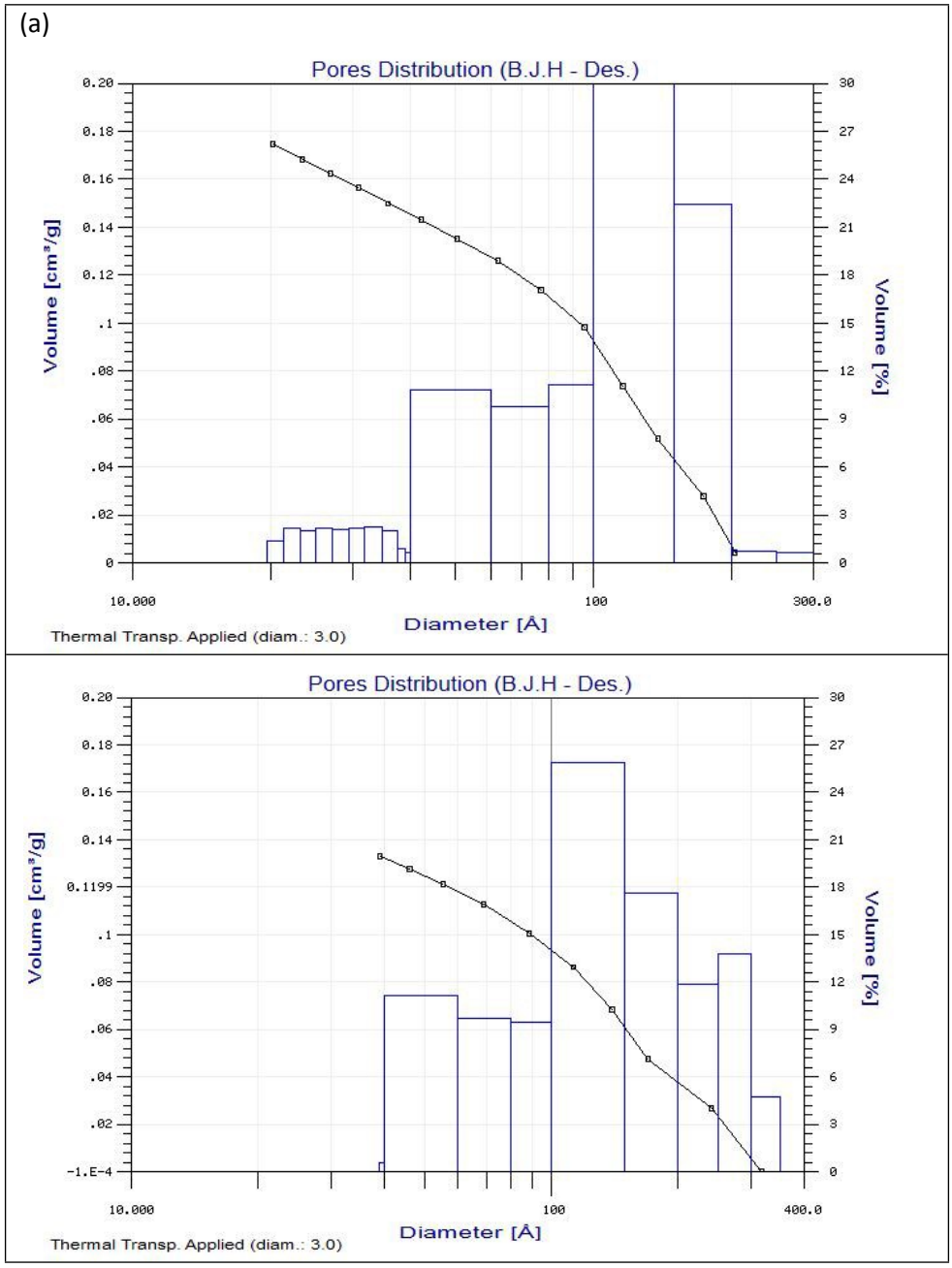

Fig. S9 (a) Pore size distribution in InOOH nanostructures. (b) Pore size distribution in *rh*-In_2O_3 nanostructures.

References

S1. O.M. Berengure, A.D. Rodrigues, C.J. Dalmaschio, A.J.C. Lanfredi, E.R. Leite, and A.J. Chiquito, *J Phys D:Appl Phys*, 2010, **43**, 045401.