

INFORMATION ON DOCTORAL THESIS

1. Full name: **TRAN THI QUYNH HOA**
2. Sex: **Female**
3. Date of birth: **22/03/1982**
4. Place of birth: **Hanoi, Vietnam**
5. Admission decision number: **2385/SĐH** dated 29 Jun 2007 by President of Vietnam National University, Hanoi
6. Changes in academic process: None
7. Official thesis title: **Fabrication and characterization of ZnS nanomaterials**
8. Major: **Solid State Physics**
9. Code: **62 44 07 01**
10. Supervisors: **Assoc. Prof. Dr. Nguyen Ngoc Long**

Assoc. Prof. Dr. Ta Dinh Canh

11. Summary of the new findings of the thesis

- First time in Vietnam, the ZnS nanocrystals with the size of several nanometers have been successfully fabricated by using a sonoelectrochemical method. The ZnS nanocrystals possess a face-centered-cubic structure and exhibit the quantum confinement effect. In these nanocrystals the surface defects play an important role in optical processes.
- The ZnS host nanocrystals and the Mn-doped ZnS nanocrystals have been successfully synthesized by hydrothermal method. The mechanism of photoluminescence and photoluminescence excitation in these nanocrystals has been analyzed in detail. In particular, the optical transitions within $3d$ levels of Mn^{2+} ion were observed at the same time in the diffuse reflection, absorption, photoluminescence and photoluminescence excitation spectra in the range of temperature from 10 K to room temperature. The photocatalytic properties of the ZnS and ZnS:Mn samples have been studied to decolorize waste in the textile dyeing industry.
- The surface passivation of ZnS:Mn nanoparticles by the TG organic and ZnS inorganic shells has been successfully performed. It was found that the coating ZnS:Mn nanocrystals with a shell remarkably decreased the surface defects, therefore, enhanced the emission of Mn^{2+} ions. In addition, the overcoating ZnS:Mn nanocrystals decreased the strength of quantum confinement, therefore, made the band edge of core/shell nanocrystals shift to the lower energy side compared with the bare nanocrystals

12. Paratical applicability, if any: the ZnS:Mn nanomaterials studied in the thesis can find their applications in preparation of biosensors, light emitting diodes, and so on.

13. Further research directions, if any: To study the applicability of ZnS: Mn in bio-medicine.

14. Thesis-related publications:

1. **Tran Thi Quynh Hoa**, Nguyen Ngoc Long, Ta Dinh Canh (2008), "Optical properties of ZnS nanoparticles synthesized by hydrothermal method", *Proceeding of the 5th national conference on optics and spectroscopy*, pp. 521 - 526.

2. **Tran Thi Quynh Hoa**, Nguyen Ngoc Long, Nguyen Hoang Hai (2008), "Structural and optical properties of ZnS nanoparticles synthesized by sonoelectrochemical method", *VNU Journal of Science, Mathematics – Physics* 24 (1S), pp. 1 - 4.

3. **Tran Thi Quynh Hoa**, Hoang Manh Ha, Nguyen Hoang Nam, Ta Dinh Canh, Nguyen Ngoc Long (2009), "Photocatalytic properties of ZnS synthesized by hydrothermal method", *Proceeding of the 6th national conference on solid state physics and materials science*, pp. 673 - 677.

4. **Tran Thi Quynh Hoa**, Le Van Vu, Ta Dinh Canh, and Nguyen Ngoc Long (2009), "Preparation of ZnS nanoparticles by hydrothermal method", *Journal of Physics Conference Series* 187, p. 012081.

5. **Tran Thi Quynh Hoa**, Ngo Duc The, Stephen McVitie, Nguyen Hoang Nam, Le Van Vu, Ta Dinh Canh, and Nguyen Ngoc Long (2011), "Optical properties of Mn-doped ZnS semiconductor nanoclusters synthesized by a hydrothermal process", *Optical Materials* 33, pp. 308 - 314.

6. **Tran Thi Quynh Hoa**, Nguyen Hoang Nam, Ta Dinh Canh, Nguyen Ngoc Long, Hoang Manh Ha (2011), "Optical and Photocatalytic Properties of ZnS:Mn Nanocrystals", *e-J. Surf. Sci. Nanotech.* 9, pp. 516-520.

7. **Tran Thi Quynh Hoa**, Le Thi Thanh Binh, Le Van Vu, Nguyen Ngoc Long, Vu Thi Hong Hanh, Vu Duc Chinh, and Pham Thu Nga (2012), "Luminescent ZnS:Mn/thioglycerol and ZnS:Mn/ZnS core/shell nanocrystals: Synthesis and characterization " (accepted by *Optical Materials*).