Information on Doctoral thesis of Fellows Nguyen Thi Thuy

1. Full name: Nguyễn Thị Thủy

2. Sex: Female

3. Date of birth: 02/06/1980

4. Place of birth: KonTum province

5. Admission decision number: 1691/QĐ-SĐH date 07/05/2009 of director of Hanoi National University.

6. Changes in academic process:

7. Official thesis title: *Study on the electric and magnetic properties of thermoelectric perovskite compounds*

8. Major: Solid State Physics

9. Code: 62440104

10. Supervisor: 1. Prof. Đặng Lê Minh

2. Dr. Ngyễn Trọng Tĩnh

11. Summary of the new finding of the thesis:

- The perovskite compounds $CaMnO_3$ and $LaFeO_3$ were doped ions: La, Fe, Y, Nd: $Ca_{1-x}Y_xMnO_3$, $Ca_{0.9}Y_{0.1-x}Fe_xMnO_3$, $La_{1-x}Y_xFeO_3$ in bulk, thinfilm, nanosize forms prepared successfully by different methods such as: ceramic, high energy milling, sol - gel, and coprecipitation method. The compounds with orthorhombic single phase belong to the Pnma. With the La, Fe, Y, Nd doping, the crystalline and the lattice structure is strongly distorted. It leads to the mixvalance effect and strongly variation of the magnetic and electric properties of the samples.

- The doped sample $CaMnO_3$ and $LaFeO_3$ in bulk or nanosize form has n-type or p-type semiconducting behavior. The sign of Seebeck coefficient of the samples is changed from negative to positive depending on the doping concentration and temperature. The doping of Y and Fe make increasing of the conductivity and power factor of the doped $CaMnO_3$ in the temperature range of (300K-950K). It lead to change their magnetic properties, too.

- For the first time, the transition of “metallic-semiconductor” conductivity behaviors is observed in the doped perovskite having high resistivity like a dielectric material at high temperature (>300K).

- The thermoelectric sample $CaMnO_3$ and $LaFeO_3$ were doped ions: La, Fe, Y, Nd $CaMnO_3$ and $LaFeO_3$ in bulk or nanosize form exhibited a weak ferromagnetic behavior. Effect negative

magnetization (the Spin reorientation) was observed at ZFC measuring state in sample $Ca_{0.9}Y_{0.1-x}Fe_xMnO_3$. Magnetocrystalline anisotropy influence the magnetic properties of the doped sample $LaFeO_3$ in bulk and nanosize form. The particle size influences the magnetic properties of nano-doped $LaFeO_3$, it could be ferromagnetic or superparamagnetic, we suggested that the ratio $S = M_r / M_s$ could be used as a functionally parameter for evaluating the homogeneity on dimension of nanoparticles and the limit of single domain size of the magnetic nano-sized powder materials.

- The doped perovskite powder $LaFeO_3$ could be used in thick film ethanol sensors and prepared muliferoic materials which showed good ferromagnetic and ferroelectric properties.

12. Paratical applicability, if any:

- The perovskite compounds $CaMnO_3$ in bulk were doped ions: Fe, Y, can be created thermoelectric devices or high temperature electrode.

- The doped perovskite powder $LaFeO_3$ could be used in thick film ethanol sensors and prepared muliferoic materials which showed good ferromagnetic and ferroelectric properties. Besides, this material can be used as a catalyst in making H_2 gas in aerospace industry. It can be used as a catalyst in waste disposal of chemical fertilizer factory.

13. Further research directions, if any:

- Study on the electrical and thermoelectric properties of $CaMnO_3$ materials doped another race-earth element and transitional metals to finding the material with high PF value.

- Study on the electrical and magnetic properties of $LaFeO_3$ materials doped another race-earth element and transitional metals to finding the material has super-paramagnetic properties. So, this material can be used in medicine.

- Study on application of of $CaMnO_3$ and nano powder $LaFeO_3$ materials doped another race-earth element and transitional metals.

14. Thesis-reated publications:

[**1] Nguyen Thi Thuy**, Đang Le Minh (2012), "Size effect on the structural and magnetic properties of Nanosized perovskite $LaFeO_3$ prepared by different methods"*, Advances in Materials Science and Engineering,* Volume 2012, Article ID 380306, 6 pages doi:10.1155/2012/380306.

[2] Nguyen Thi Thuy, Dang Le Minh, Ho Truong Giang, Nguyen Ngoc Toan (2014), "Structural, Electrical, and Ethanol-Sensing Properties of $La_{1-x}Nd_xFeO_3$ Nanoparticles"*, Advances in Materials Science and Engineering* Volume 2014, Article ID 685715, 5 pages, http://dx.doi.org/10.1155/2014/685715".

[3] Nguyen Thi Thuy, Đang Le Minh and Bach Thanh Cong (2012), "The structural and magnetic properties of the double rare-earth elements $La_{1-x}Nd_xFeO_3$ nanoparticles"*, ISRN Materials Science,* Volume 2012 Article ID 213905 6 pages doi:10.5402/2012/213905., 2012.

[4] Nguyen Thi Thuy, Đang Le Minh and Ngo Van Nong (2012), "Thermoelectric properties of $Ca_{1-x}Y_xMnO_3$ and $Ca_{0.9}Y_{0.1-y}Fe_yMnO_3$ perovskite compound", *Tạp chí Khoa học và Công nghệ - Viện Khoa học và Công nghệ Việt nam*, Tập: 50, Số: 1B, trang 335.

[5] Nguyen Thi Thuy, Đang Le Minh (2012), "Structural and ethanol-sensing properties of $La_{1-x}Y_xFeO_3$ nanoparticles", *Journal of Science Hue University*, Tập: 77, Số: 8, trang 85

[6] Nguyễn Thị Thủy, Hoàng Trọng Đức, Đặng Lê Minh (2012), "Tính sắt từ yếu của nano perovskite $La_{1-x}Y_xFeO_3$", *Tạp chí khoa học và Giáo dục Đại học Sư phạm Huế,* Số: 01, trang 12.

[7] Nguyễn Thị Thủy, Đặng Lê Minh, Ngô Văn Nông (2011), "Tính chất nhiệt điện của hợp chất perovskite $Ca_{1-x}Y_xMnO_3$ và $Ca_{0.9}Y_{0.1-y}Fe_yMnO_3$", *Kỷ yếu Hội nghị Vật lý Chất rắn và Khoa học Vật liệu toàn quốc lần thứ 7* - Thành phố Hồ Chí Minh 07-09/11/2011.

[8] Nguyễn Thị Thủy, Trần Ngọc Thanh Thủy, Đặng Lê Minh (2011), "Ảnh hưởng của kích thước hạt lên tính chất từ của nano perovskite $La_{1-x}Nd_xFeO_3$", *Kỷ yếu Hội nghị Vật lý Chất rắn và Khoa học Vật liệu toàn quốc lần thứ 7* - Thành phố Hồ Chí Minh 07-09/11/2011.

[9] Nguyễn Thị Thủy, Đặng Lê Minh, Hồ Trường Giang, Nguyễn Ngọc Toàn (2011), "Tính chất nhạy khí Ethanol của nano perovskite $La_{1-x}Nd_xFeO_3$", *Kỷ yếu Hội nghị Vật lý Chất rắn và Khoa học Vật liệu toàn quốc lần thứ 7* - Thành phố Hồ Chí Minh 07-09/11/2011.

[10] Nguyen Thi Thuy, Nguyen Minh Tuan, Dang Le Minh, Nguyen Phu Thuy (2009), "The electric property of the double rare-earth elements perovskite compound ($La_{1-x}Y_xFeO_3$)", *Kỷ yếu Hội nghị Vật lý Chất rắn và Khoa học Vật liệu toàn quốc lần thứ 6* - Đà Nẵng 08-10/11/2009, trang 182.

[11] Dang Le Minh, **Nguyen Thi Thuy**, Nguyen Ngoc Dinh, Vu Tung Lam, Le Quang Tien Dung and Truong Van Chuong (2011), "The electric and magnetic properties of the multiferroic $LaFeO_3$-PZT compound", *Kỷ yếu Hội nghị Vật lý Chất rắn và Khoa học Vật liệu toàn quốc lần thứ 6* - Đà Nẵng 08-10/11/2009, trang 186.

[12] Dang Le Minh, Nguyen Minh Tuan, **Nguyen Thi Thuy** (2009), Nguyen Phu Thuy, Nguyen Thanh Trung, "The magnetic anomaly of the double rare-earth elements Perovskite compound ($La_{1-x}Y_x$)FeO_3 and ($La_{1-y}Nd_y$)FeO_3) ", *Kỷ yếu Hội nghị Vật lý Chất rắn và Khoa học Vật liệu toàn quốc lần thứ 6* - Đà Nẵng 08-10/11/2009, trang 189.