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논문개요집

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2021 KMS Summer Conference

논문개요집

일시 2021. 7. 21(수) ~ 23(금)

장소 강릉 세인트존스호텔

주최 한국자기학회

후원 KOFST 한국과학기술단체총연합회 GWTO 강원도관광재단 Gangwon Tourism Organization GSIPA (재)강릉과학산업진흥원 KIMS 한국재료연구원 epU 파워유닛스마트제조센터

Digests of the 2021 KMS Summer Conference

The Korean Magnetics Society

7월 21일(수) 13:00~18:00

Session : 포스터발표 1

로비

※ 비대면 진행

○ Session EM [Electro-Magnetic Energy Conversion]

○ Session MS [Magnetics in Medical Science]

○ Session MM [Mössbauer Magnetics]

○ Session SS [Spintronics]

MM04

Mössbauer studies on core-shell $Fe_{1.5}$@Pt/C nanoparticles post-heated in NH_3 gas atmosphere

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$Fe_{1.5}$@Pt/C core-shell is used as an electrode catalyst for fuel cells, and research has been conducted to reduce costs and improve performance for application to fuel cells. In this study, the structural and magnetic properties of the $Fe_{1.5}$@Pt/C core-shell heat treated in an NH_3 gas atmosphere were investigated.

The $Fe_{1.5}$@Pt/C core-shell was prepared using the sonochemical method. $Fe(acac)_3$, $Pt(acac)_2$, and carbon support (Vulcan XC-72R) were dispersed in ethylene glycol. The mixture was placed in a girb0type sonicator and then it was irradiated over 3 h. To remove residual ethylene glycol, the obtained black slurry was filtered and washed with ethanol and DI water. The sample was dried in a vacuum oven at 70 °C for 12 h. Then, the post-heat treated $Fe_{1.5}$@Pt/C samples in an NH_3 gas atmosphere were annealed at 510 °C for 2 h. To remove iron oxides and other residues from the heat-treated sample, the sample was acid-treated in 0.1M $HClO_4$ at 85 °C for 2 h. In order to obtain a clear core-shell structure, the sample was additionally annealed at a temperature of 300 °C in an H_2/N_2 atmosphere for 2 h. And finally, $Fe_{1.5}$@Pt/C with a core-shell structure was obtained. The sample was denoted as Fe1.5@Pt/C_NH3.

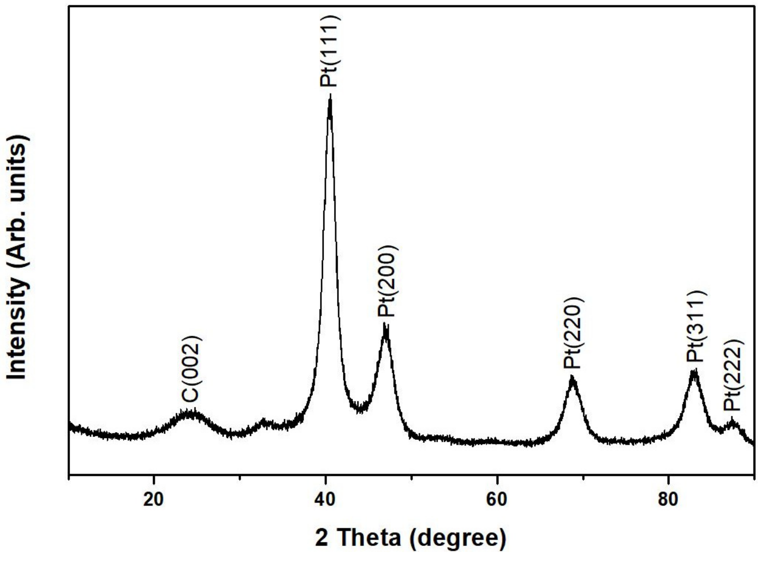

Fig. 1. XRD patterns of $Fe_{1.5}$@Pt/C _NH_3

The crystallographic properties and core-shell structure of the $Fe_{1.5}$@Pt/C_NH_3 core-shell were confirmed through X-ray diffraction (XRD), transmission electron microscopy (TEM), and scanning transmission electron microscopy–energy dispersive spectroscopy (EDS). In addition, in order to investigate the magnetic properties of

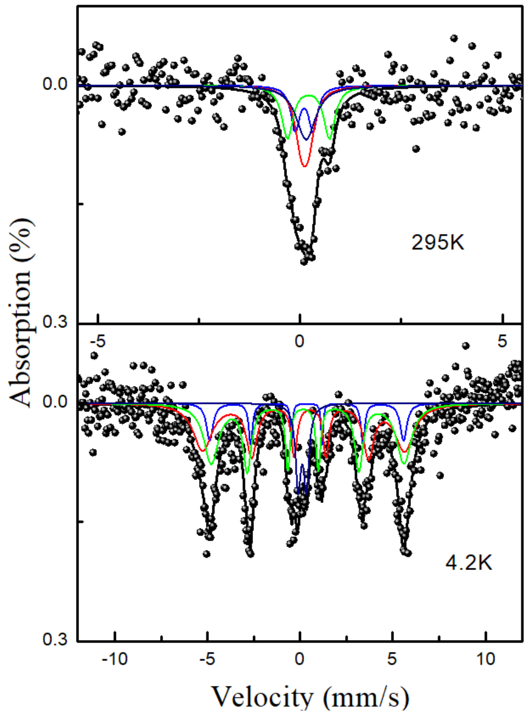

Fig. 2. Mössbauer spectra of $Fe_{1.5}$@Pt/C_NH_3 at 4.2 and 295K

the sample, the Mössbauer spectra were observed at 4.2 and 295 K and the M-H curve was measured using a vibrating sample magnetometer (VSM). Pt peaks were confirmed from the XRD patterns and the average crystallite sizes of the sample was confirmed to be 4.9 ± 1.4 nm using TEM image. The EDS line profile of $Fe_{1.5}$@Pt/C_NH_3 revealed a core-shell structure with a Pt skin layer (0.3 nm). The saturation magnetization and coercivity at 295 K were 7.1 emu/g and 134.5 Oe, respectively. The Mössbauer spectrum of the $Fe_{1.5}$@Pt/C_NH_3 at 295 K were analyzed with 4 sets of doublets and the electric quadrupole splitting (ΔE_Q) values were $\Delta E_{Q,1}$ = 0.44 mm/s, $\Delta E_{Q,2}$ = 0.17 mm/s, $\Delta E_{Q,3}$ = 1.04 mm/s, and $\Delta E_{Q,4}$ = 0.07 mm/s, respectively. Also, the spectrum at 4.2K was measured with 3 sets of sextet and one doublet and the magnetic hyperfine field (H_{hf}) values were analyzed as $H_{hf,1}$ = 325.2 kOe, $H_{hf,2}$ = 339.7 kOe, and $H_{hf,3}$ = 323.6 kOe, respectively. From the isomeric shift values, all Fe valence states was determined to be ferric.