Saengdoen Daungdaw 2009: Preparation of $LaCoO_3$ Perovskite for CO Gas Sensor. Master of Science (Chemistry), Major Field: Chemistry, Department of Chemistry. Thesis Advisor: Ms. Pinsuda Viravathana, Ph.D. 141 pages.

The $LaCoO_3$-ss (1:1, 1:5 (high Co), and 5:1 (high La)) perovskites were prepared by solid state reaction method. All $LaCoO_3$ samples were prepared and characterized by X-ray diffraction (XRD), X-ray absorption near-edge structure (XANES), BET surface area, and scanning electron microscopy (SEM). Their properties were compared with those of the samples prepared by co-precipitation ($LaCoO_3$-cp) and modified wet powder dispersion ($LaCoO_3$-wd) methods. The main crystalline phase of all prepared $LaCoO_3$ was a rhombohedral perovskite structure. The crystallite sizes of $LaCoO_3$-ss (1:1, high Co, and high La) at 850°C were 122, 42, and 73 nm and the crystallite sizes at 700°C of $LaCoO_3$-wd and $LaCoO_3$-cp were 28.5 and 28.2 nm, respectively. The surface areas were 1.6, 3.9, and 5.2 m^2g^{-1} for $LaCoO_3$-ss (1:1, high Co, and high La), respectively. From co-precipitation and modified wet powder dispersion methods, the surface areas were 11.8 and 11.7 m^2g^{-1}, respectively. From XANES spectra, the average Co oxidation state of the $LaCoO_3$-ss (1:1 and high La) could be ≈ 3 and the average oxidation state of $LaCoO_3$-ss (high Co) was from 2 to 8/3. Moreover, SEM images showed the difference in morphology which strongly depended on the preparation methods. At the voltages of 7.5 volts, corresponded to temperature of 133°C measured at the $LaCoO_3$ surface, the resistance of prepared $LaCoO_3$ was lowest (highest conductivity). The fabricated sensors had been tested as CO gas sensors with the CO concentration of 1.98-19.84%v/v, 0.39-99.2%v/v, and 0.006-0.039%v/v at 7.5 volts. The $LaCoO_3$-ss (1:1) sensor performed the highest CO sensing capability compared to $LaCoO_3$-cp and $LaCoO_3$-ss (high Co). The detection limits of $LaCoO_3$-ss (1:1) and $LaCoO_3$-cp on CO sensing were of 0.006% (60 ppm) for CO concentration with the sensitivity of 1.007 and 1.013, respectively.

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