Properties of Cu-Ni Ferrite Nanopowders Prepared by Coprecipitation Method with Ultrasound Irradiation

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Abstract

Carbon dioxide is one of the greenhouse gases and has been a current subject in the field of environmental science. Recently, it has been found that oxygen-deficient ferrite is a good material to convert carbon dioxide into carbon.[1,2] The oxygen-deficient ferrite can be formed by hydrogen reduction of ferrites at a temperature near 300℃ and is represented by a general formula $M_xFe_{3-x}O_{4-\delta}$ where M is a bivalent metal ion such as Mn, Fe, Co, Ni and Cu ; the oxygen deficiency δ expresses the degree of reduction.

In this study, $Cu_{1-x}Ni_xFe_2O_4$ nanopowders using coprecipitation method with ultrasound irradiation were synthesized and their CO_2 decomposition properties were investigated. Ultrasonic irradiation in liquid can induce a cavitation process. The cavitation leads to hot-spot and microjet impacts on materials, which can result in activating physical and chemical reaction.[3]

Cu-Ni ferrite nanopowders synthesized by coprecipitation method with ultrasound irradiation were in a spherical shape of the single phase. The magnetic properties of the powders were determined with vibrating sample magnetometry (VSM) and the maximum value of saturation magnetization was 73.5 emu/g at x=0.5. Thermogravimetric analysis (TGA) of the $Cu_{1-x}Ni_xFe_2O_4$ nanopowders during H_2 reduction and CO_2 decomposition reaction were carried out with Cahn vacuum electrobalance system (D-200). The maximum CO_2 decomposition occurred from the $Cu_{0.5}Ni_{0.5}Fe_2O_4$ nanopowder.

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References

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