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Preparation and Characterization of a New Layered Double Hydroxide, Mg–Fe–Ce

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1 Introduction

In the present paper, $MgCl_2$•$6H_2O$, $FeCl_3$•$6H_2O$, and $CeCl_3$•$6H_2O$ were used as raw materials in the precipitation-hydrothermal method to synthesize MgFeCe hydrotalcite. The effects of the Fe:Ce molar ratio on the composition, crystal structure, and thermal stability of hydrotalcite are examined. Energy-dispersive X-ray spectroscopy (EDS), X-ray diffraction, Fourier-transform infrared spectroscopy (FTIR), and transmission electron microscopy (TEM) were used to characterize the synthetic products. A 10 nm wide and 150 nm long rod-like MgFe-layered double hydroxide (LDH) containing Ce was firstly synthesized. When the Fe:Ce molar ratio of Fe/Ce is higher than 1.5, the synthetic hydrotalcite shows good structure and high crystallinity. When the molar ratio of Fe:Ce is 1:4, the diffraction peak of the product widens and disperses, and the structure of hydrotalcite is still achieved but with low crystallinity. EDS analysis results show that with the decrease in Fe content and the increase in Ce content in the saline reaction solution, the variation in content of Fe in the product is similar to that of Ce. With the decrease in Fe content and the increase in Ce content in the saline reaction solution, the interplanar crystal spacing and cell parameter c and a of the crystal (003) and (001) tend to increase. The TEM images show that the Ce-containing MgFe-LDH has the typical layer structure.

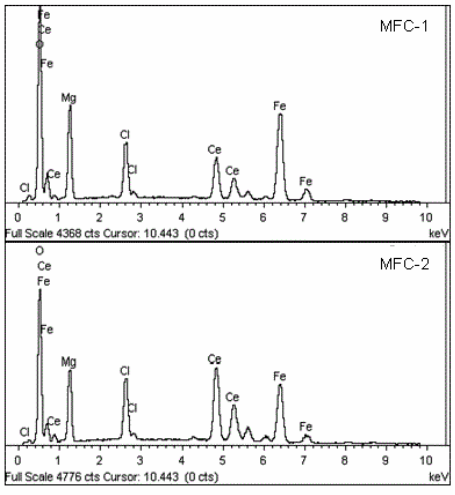

Fig. 1. EDS spectra of cerium-containing MgFe-LDH.

2 Result

3 Conclusion

In the present paper, a 10 nm wide and 150 nm long rod-like MgFeCe-LDH was successfully synthesized. When the Fe:Ce molar ratio in the feed solution is greater

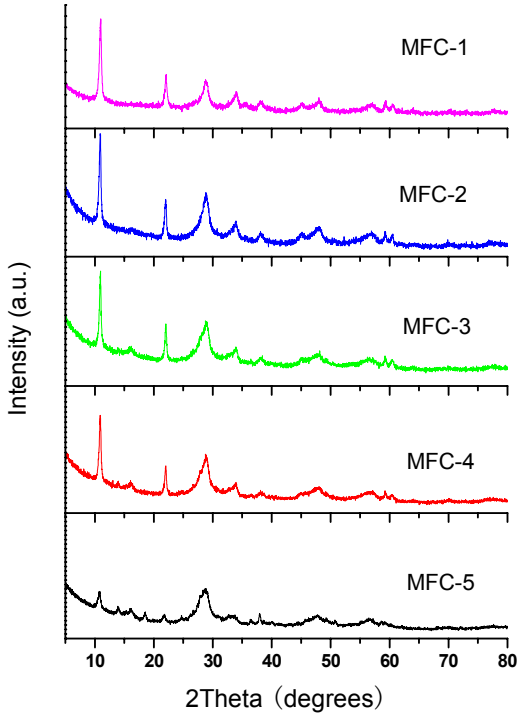

Fig. 2. XRD patterns of Ce-containing MgFe-LDH at different Fe^{3+}:Ce^{3+} molar ratios.

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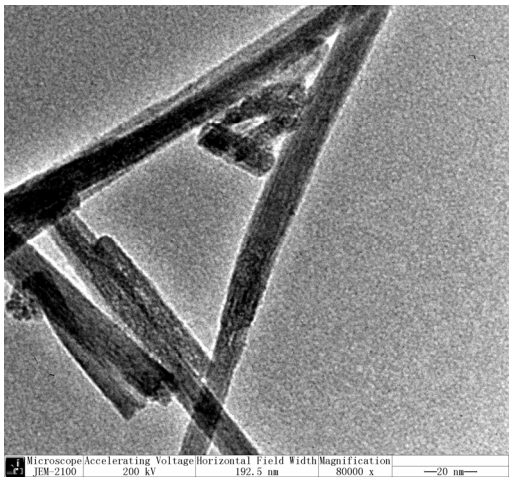

Fig. 3. TEM images of MFC-2.

than 1.5, the synthesized hydrotalcite has a rigid hydrotalcite structure and high crystallinity. When the Fe:Ce molar ratio is 1:4, the diffraction peak of the resultant product (MFC-5) widens and disperses, a hydrotalcite structure with low crystallinity is formed. EDS analysis showed that with the decrease in Fe content and the increase in Ce content in the saline reaction solution, the variation in content of Fe in the product is similar to that of Ce. Crystal plane spacing and lattice parameter *c* and *a* of the obtained crystal (003) and (110) tend to increase.

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