Synthesis and electrochemical properties of hexagonal nickel hydroxide nanosheets

大学院自然科学研究科　前期課程　松田祐貴
〃　助教　伊田進太郎
〃　教授　松本泰道

Abstract

One-nanometer-thick nickel hydroxide nanosheets were prepared by exfoliation of layered nickel hydroxides intercalated with dodecyl sulfate (DS) ions. The shape of the nanosheets was hexagonal, as was that of the layered nickel hydroxides intercalated with DS ions. The nickel hydroxide nanosheets exhibited charge-discharge properties in strong alkaline electrolyte. The morphology of the nanosheet changed during the electrochemical reaction.

Results and Discussion

Fig 1. shows the X-ray diffraction (XRD) pattern and SEM image of layered nickel hydroxides. It can be seen that the layered nickel hydroxides has irregular hexagonal plate-like morphology. Several (00*n*) reflections were observed. The basal spacing calculated from the reflection angle was 2.69 nm. On the basis of the results of X-ray fluorescence, thermal gravimetry/differential thermal analysis, anion chromatography, and elemental analysis, the chemical composition of the precursor obtained was estimated to be $Ni(OH)_{1.65}(DS)_{0.33}(NO_3)_{0.02}\cdot 0.7H_2O$.

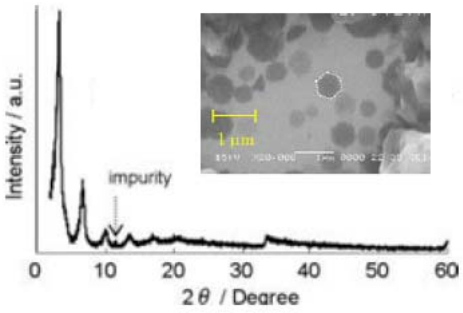

Fig 1. XRD pattern and SEM image of layered nickel hydroxide intercalated with dodecyl sulfate (DS) ions.

Conclusion

1-nm-thick hexagonal nickel hydroxide nanosheets were prepared by exfoliation of layered nickel hydroxides intercalated with DS ions, which exhibited charge−discharge properties in strong alkaline electrolyte. The electrochemically active nanosheets are expected be used as building blocks for ultrathin film devices.

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