Precipitation sequence study in the Ce-Mg-Zn system using powder neutron diffraction

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Ce-Mg-Zn system is one of the key ternary systems for the design of Mg alloys with Rare earth (RE) and Zn. Experimental investigation of this system is limited though a few isothermal sections and vertical sections were reported in the literature [1-3].

In this study, neutron diffraction patterns are collected at chosen temperatures for selected samples when they were cooling down from their liquid state on powder diffractometer C2. Fig. 1 shows the analysis result for one of the sample ($Ce_{40}Mg_{20}Zn_{40}$) from GSAS. $CeZn_2Mg$ is the first phase to appear during the solidification process at a temperature between 670°C and 650°C, followed by Ce(Mg,Zn), which appears between 650°C and 630°C.

When coupled with DSC measurement and XRD, analysis from neutron diffraction can yield information on phase transformation as well as phase relationship at different temperatures, allowing accurate determination of phase diagram.

Information on liquid can also be obtained from neutron diffraction. A big hump followed by oscillation can be seen in Fig.1 at high temperature. This information can be used to study the short range ordering, which will be conducted in the future analysis when new samples are examined.

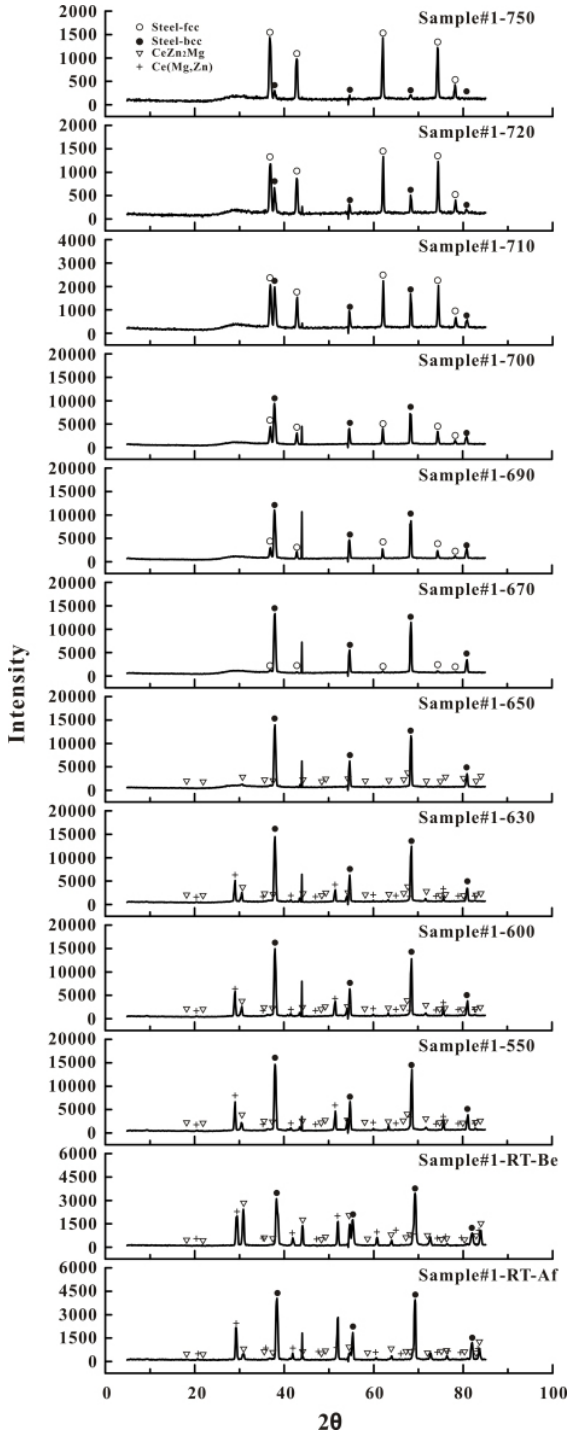

Fig. 1 Analyzed neutron patterns on sample one ($Ce_{40}Mg_{20}Zn_{40}$)

References

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