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

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Following our previous neutron diffraction experiments on Ce-Mg-Zn system, experimental work on Nd-Mg-Zn systems was carried out.

In the present experiments, selected samples for Nd-Mg-Zn system were subjected to slow cooling from the melt in a furnace mounted in a powder diffractometer. Diffraction patterns are collected every 5 ^{o}C. The phase transformation behaviors of the samples were obtained by analyzing these diffraction patterns.

The diffraction patterns of $Nd_{20}Mg_{20}Zn_{60}$ are shown in Fig.1 as an example. According to the experiments, Nd_3Zn_{11} was the primary phase upon cooling, which crystallized at 735 ^{o}C. The Tao3 phase then appeared at 720 ^{o}C. $Nd_{13}Zn_{58}$ was identified at 680 ^{o}C and Nd_3Zn_{11} was found to disappear at the same temperature. Finally, another possible phase, Tao4, was identified at 620 ^{o}C.

The Nd-Mg-Zn system was then optimized taking into account all experimental data. As an example, a vertical section of $Nd_{20}Mg_{80}$-$Nd_{20}Zn_{80}$ with experimental data from $Nd_{20}Mg_{20}Zn_{60}$ was calculated and shown in Fig.2. The calculated result agrees well with the experimental work.

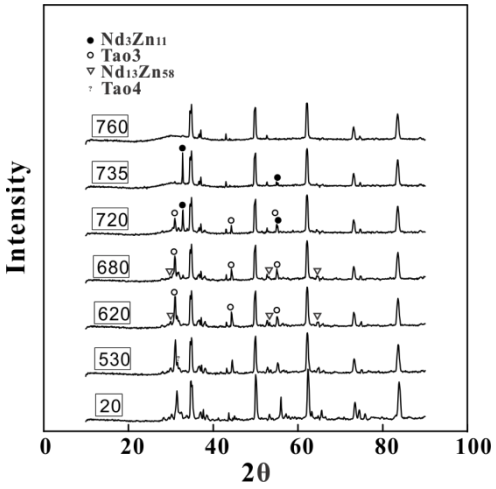

Figure 1. Analyzed neutron patterns of $Nd_{20}Mg_{20}Zn_{60}$

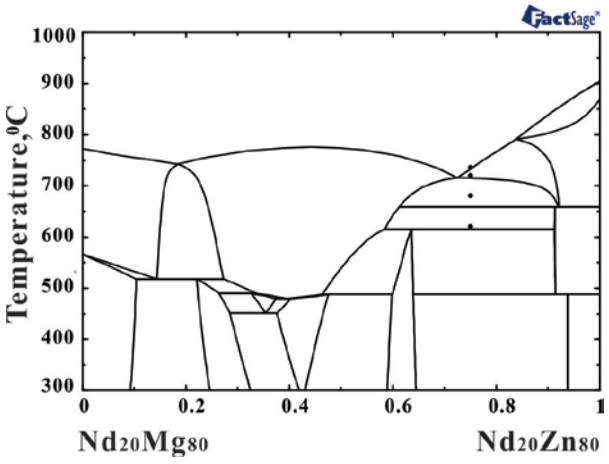

Figure 2. Calculated $Nd_{20}Mg_{80}$-$Nd_{20}Zn_{80}$ section with experimental data from $Nd_{20}Mg_{20}Zn_{60}$