Formation Mechanism of the Synchronized LPSO Phase in Mg-Based Alloys

Kazuya KONNO

Professor	kazuya@sendai-nct.ac.jp
Affiliated Societies	The Japan Institute of Metals and Materials

Keywords	Mechanical properties (26010), Metals (30010)

Research Topics

- Formation mechanism of the synchronized LPSO phase in Mg-based alloys
- Local structures around small additive elements in alloys by XAFS measurements

Research Seeds

1. Formation mechanism of the synchronized LPSO phase in Mg-based alloys

A small amount of Y in Mg is effective to improve Mg strength. Furthermore, combined addition of transition element (T) with Y induces the formation of long period stacking order (LPSO) structure in Mg-T-Y alloy, which results in high yield strength. The LPSO phase in Mg-based alloy is known as a polytypic structure, but the thermodynamically stable structure has not been clarified. We reported that $Mg_{75}Al_{10}Y_{15}$ alloy has a thermodynamically stable new order structure (Fig. 1).

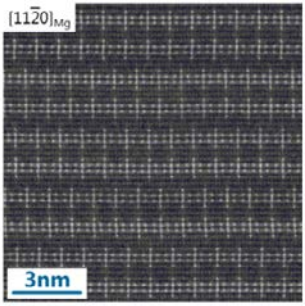

Fig. 1 New order structure in $Mg_{75}Al_{10}Y_{15}$ alloy.

2. Local structures around small additives elements in alloys by XAFS measurements

Alloys might greatly alter mechanical properties by the addition of other elements. However the measurement methods have a limit, so that the precise site occupancy of alloys of very dilute additives, such as those of ppm order, are difficult to ascertain. Measurement of the X-ray absorption fine structure (XAFS) using synchrotron radiation in the KEK and the SPring-8 can clarify the occupation position of very small amounts of additional elements. As presented in Fig. 2, we performed a XAFS investigation on the change of site occupancy of Nd and Gd in $Nd_2F_{14}B$ alloy during the HDDR process.

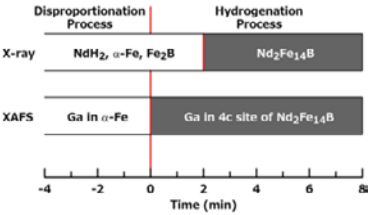

Fig. 2 Site occupancy of Nd and Ga in $Nd_2Fe_{14}B$ during the HDDR process.

Related Technology

- X-ray Analysis, Electronic Microscope
- XAFS