

High throughput synthesis and analysis of new permanent magnetic materials

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1. Introduction

Searching for new materials have been always demanding time and process cost. High-throughput technology is an approach to the rapid discovery, optimization of new materials[1-3]. In this study, high-throughput method of synthesis and analysis of magnetic materials was introduced to search for new magnetic materials.

2. Experiment

High-throughput synthesis of thin film was carried out in the vacuum chamber with the components of Quartz Crystal Microbalance (QCM) to measure the deposition rate of each source, heater to increase the temperature of large area substrate, and thermal evaporators. We could obtain continuous composition spread on the large area substrate by means of the disposition of evaporation crucibles and the distances between substrate and crucibles. The samples with composition spread were used to investigate the effect of composition ratios of magnetic materials on magnetic properties, microstructure, and preferred orientation. High-throughput analysis system is composed of the permanent magnets with surface magnetic intensity of 1.3 T, a continuous reel to reel tape moving device, and a three-axis Hall sensor. The system can measure the hysteresis loop in each position of tape using a permanent magnet while the tape moves at regular intervals. The advantages that can be obtained in this high throughput experiment are as follows. 1) We can obtain compounds having different composition ratios in a run. The magnetic properties of them can be quickly determined through the continuous measurement results. 2) The reliability of results of the composition ratio dependency is high because all the compounds on the substrate experience the same deposition conditions except for the composition ratio.

3. Conclusion

The high-throughput methodology offers rapid and efficient magnetic materials screening, optimization and discovery.

4. References

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