

Structural Analysis of a new Thermoelectric Material: $\text{Mn}_{3-x}\text{Cr}_x\text{Si}_4\text{Al}_2$ **AIST Kansai, Tristan Barbier, Ryoji Funahashi, Emmanuel Combe****E-mail: tristan.barbier@aist.go.jp**

In recent years, thermoelectric materials have been intensively explored for possible applications to environmentally electrical power generators due to their capacity to convert the waste heat into electricity. In fact, thermoelectricity is considered as a promising solution for close energy crisis and global climate change. This technology can potentially emerge for sectors as automotive, industry, building, solar conversion etc... These technologies could be available only if performing and cheap thermoelectric materials, operating at temperatures well beyond room temperature, are available.

For low temperature range applications (i.e. below 200°C), best performances are obtained by the well-known Bi_2Te_3 with optimum ZT values around 1 (or higher) at 120°C [1]. However, it is well known that tellurium is toxic, scarce and expensive which prevents the use of this bulk thermoelectric material for large-scale applications and the necessity need to find alternative thermoelectric materials for the same temperature range. In this context, we have recently shown that $\text{Mn}_{3-x}\text{Cr}_x\text{Si}_4\text{Al}_2$ is an attractive candidate, which possesses a high power factor values [2].

So in order to fully understand this material, a complete structural study was performed using High Resolution X-ray Diffraction. On one hand the atomic arrangement and the phase stability versus the temperature will therefore be described in this presentation. And on another hand the crystallographic modifications induced by the different syntheses processes employed will be discussed.

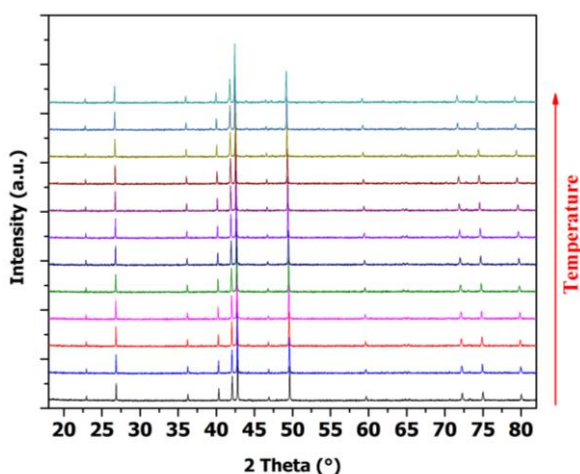


Figure 1: XRD patterns of $\text{Mn}_{2.7}\text{Cr}_{0.3}\text{Si}_4\text{Al}_2$ obtained from 30°C to 600°C.

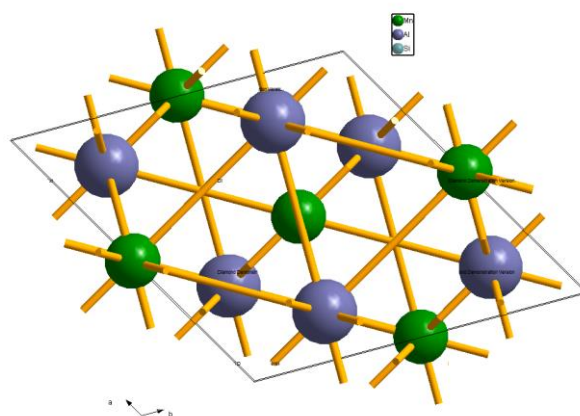


Figure 2: Schematic representation along the *c* axis of $\text{Mn}_{2.7}\text{Cr}_{0.3}\text{Si}_4\text{Al}_2$

[1] T. M. Tritt and M. A. Subramanian, MRS Bulletin, 31 (2006).

[2] R. Funahashi *et al.*, Journal of Applied Physics 112, 073713 (2012).