

### *Abstract*

It has been more than a century the discovery of an amazing alloy by Fritz Heusler, up to now Heusler compounds are still a field of active research. They are a remarkable class of intermetallic materials with formula of 1:1:1 (often called Half-Heusler) or 2:1:1 which composition may more than 1500 members. Why Heusler compounds are so interesting to be studied? Surprisingly, because the properties of many Heusler compounds can easily be predicted by the valence electron count. Future technology devices based on multifunctional properties, i.e. the combination of two or more functions such as magnetocaloric and thermoelectric effect. The Heusler compounds consist of subgroup, which more than 250 semiconductors are of high relevance for the development of novel materials for energy technologies. Their band gaps can be tuned from zero to about 4 eV by changing their chemical composition. Therefore, the Heusler compounds are great interest that has been attracted in the fields of thermoelectric and magnetocaloric research (Graf et al., 2011).

Modern life has been support mainly by huge energy consumption. Worldwide, it is about 15% of the overall energy consumption coming from refrigeration. Recent modern refrigeration units work based on vapour compression plants, whose development is strictly related to the characteristics of the working fluids (chemical reaction), since the very beginning of their commercial diffusion. The traditional refrigerant fluids, i.e. CFCs and HCFCs, have been banned because of their impact to the disruption of the stratospheric ozone layer (Ozone-Depleting substances ODs).

Researcher of all over the world suggested an interesting alternative of refrigeration machine to solve the ecology problems. It work based on magnetocaloric effect (MCE). Then, magnetic refrigeration is an emerging new technology. The magnetic refrigeration can be an environment-friendly and efficient technology compared to conventional vapour compression systems. The magnetic refrigerant is an environment friendly because it is solid, has essentially zero vapour pressure, and therefore is ecologically sound with no direct Ozone Depletion Potential (ODP) and zero direct Global Warming Potential (GWP). The Active Magnetic Regenerator (AMR) is the main principle of a magnetic refrigerator system. The AMR is a special kind of thermal regenerator made of magnetic material that works both as a refrigerating and as a heat regenerating medium (Aprea et al., 2015).

Both magnetocaloric and thermoelectric properties could be found in a Heusler alloys system. In this work, we explore magnetocaloric and thermoelectric properties of iron-based Heusler alloy because iron-based means low cost, earth abundant, rare earth free. Iron-based Heusler alloy have attracted an enormous amount of attention for green, energy efficient, active near room temperature thermal management. As far we concern, there are not many results reported iron-based of Heusler alloy that shows excellent properties for both magnetocaloric and thermoelectric effect. Therefore, it is important to investigate

thermoelectric and magnetocaloric properties iron-based of Heusler alloy and we suggest this work to accomplish the challenges.

Keywords: Heusler Alloy; Iron-based; magnetocaloric; thermoelectric