eration capacity RC values were computed by numerically integrating the areas under the ΔSm vs. temperature curves, using the temperatures at the half maximum of the ΔSm peak as the integration limits. Table 22 of FIG. **9** shows computed Refrigeration Capacity (RC) values for the compound $Gd_5Ge_2Si_2$ and for the compound $Gd_5Ge_2Si_2$ doped with the different metal additives, according to the embodiments.

[0050] A measure of the usefulness of the alloys with and without metal additives as potential magnetic refrigerants is indicated by subtracting from the refrigeration capacity values the corresponding average hysteresis losses and thus obtaining a net or effective refrigeration capacity (NRC): NRC=RC-average hysteresis loss. These hysteresis losses are very small (approximately 4 J/kg or less) and large (around 65 J/kg) for the alloys with and without metal additives, respectively, in the range of temperature where the RC values were computed.

[0051] The resulting NRC values are also given in Table 22 of FIG. **9**. The significantly higher NRC values and much smaller hysteretic losses of the compounds $Gd_5Ge_2Si_2$ doped with the different metal additives according to the embodiments, clearly demonstrate that the alloys with the silicide-forming metal additives are significantly superior as magnetic refrigerants for near-room temperature refrigeration applications compared to the alloy without any such metal additives. Adding a silicide-forming metal to the $Gd_5Ge_2Si_2$ compound therefore provides a magnetic refrigerant material highly suitable for near-room temperature applications.

[0052] It would be reasonable to conclude that the same mechanism that gives rise to the unusually large magnetocaloric effect is also responsible for the large hysteresis losses; namely, the field-induced crystallographic phase change.

[0053] The description as set forth is not intended to be exhaustive or to limit the scope of the invention. Many modifications and variations are possible in light of the above teaching without departing from the scope of the following claims. It is contemplated that the use of the present invention can involve components having different characteristics. It is intended that the scope of the present invention be defined by the claims appended hereto, giving full cognizance to equivalents in all respects.

The embodiments of the invention in which an exclusive property or right is claimed are defined as follows. Having thus described the invention what is claimed is:

1. A method of reducing hysteretic losses in a $Gd_5Ge_2Si_2$ refrigerant compound comprising:

providing the $Gd_5Ge_2Si_2$ compound;

doping or alloying said $Gd_5Ge_2Si_2$ compound with approximately one atomic percent of iron element (Fe), wherein said iron doped $Gd_5Ge_2Si_2$ compound has the formula $Gd_5Ge_{1.9}Si_2Fe_{0.1}$; and

further comprising heat-treating said doped compound so as to homogenize said iron doped $Gd_5Ge_2Si_2$compound.

2. The method of claim **1**, wherein the method of providing said $Gd_5Ge_2Si_2$ compound comprises arc melting mixtures of said compound elements.

3. The method of claim **1**, wherein the method of doping or alloying said $Gd_5Ge_2Si_2$ compound comprises arc melting mixtures of said iron element with said compound elements.

4. The method of claim **1**, wherein the method of forming said $Gd_5Ge_2Si_2$ compound comprises arc melting mixtures of said compound elements in an argon atmosphere at atmospheric pressure.

5. The method of claim **1**, wherein doping or alloying said $Gd_5Ge_2Si_2$ compound comprises arc melting mixtures of said iron element with said compound elements in an argon atmosphere at atmospheric pressure.

6. The method of claim **1**, further comprising heat treating said iron doped $Gd_5Ge_2Si_2$ compound in a vacuum so as to homogenize said doped compound.

7. The method of claim **1**, wherein heat-treating said doped compound so as to homogenize said iron doped $Gd_5Ge_2Si_2$ compound comprises heat-treating said iron doped compound at 1300° C.

8. The method of claim **7**, wherein heat-treating said doped compound so as to homogenize said iron doped $Gd_5Ge_2Si_2$ compound further comprises heat-treating said iron doped compound for 1 hour.

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