

Magnetocaloric Performance of DyFe₂Al₁₀ for Clean Refrigeration Technologies

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The growing demand for clean and energy-efficient technologies has intensified efforts to replace conventional, energy-intensive refrigeration systems with environmentally sustainable alternatives. Among these, solid-state refrigeration based on the magnetocaloric effect (MCE)—a reversible temperature change induced by an external magnetic field—offers a promising route by eliminating the need for harmful greenhouse gases such as CFCs. While oxide-based materials typically yield modest MCE responses, intermetallic compounds often exhibit significantly larger magnetic entropy changes (ΔS_M), making them attractive candidates for magnetic refrigeration. In particular, achieving high ΔS_M values under moderate magnetic fields is essential for practical applications. In this study, we investigate the intermetallic compound DyFe₂Al₁₀ to optimize its magnetocaloric performance under such conditions. The magnetocaloric properties of DyFe₂Al₁₀ have been systematically investigated, demonstrating its significant potential for environmentally sustainable solid-state refrigeration. The compound exhibits a pronounced magnetic entropy change (ΔS_M) near its magnetic transition temperature of approximately 7 K, indicating a strong enhancement of the magnetocaloric effect. Under an applied magnetic field of 70 kOe, the MCE reaches a peak value of approximately 12 J kg⁻¹ K⁻¹, highlighting the outstanding cooling capacity of DyFe₂Al₁₀.

References:

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