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A study of Mg-RE alloy as thermal energy storage material by using rapid solidification

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Cast and rapid solidification Ce_2Mg_{17} alloy were synthesized by induction furnace melting and single roll rapid solidification method. The effects of rapid solidification rate on kinetics, thermodynamics and cycling stability of Ce_2Mg_{17} alloy and the thermal storage mechanism were investigated by XRD (X-ray diffraction), SEM (Scanning Electron Microscope) and TEM (Transmission Electron Microscope). The reaction enthalpy of Ce_2Mg_{17} is 75.5 kJ/mol H_2 and equilibrium pressure is 0.91 MPa at 400^{O}C. The results also show that rapid solidified Ce_2Mg_{17} alloy shows a better kinetics performance, compared to those of casted samples. As the rate of rapid solidification increases, the activation property and hydrogen capacity of Ce_2Mg_{17} alloy are improved. XRD results show that during hydrogenation, Ce_2Mg_{17} forms CeHx and Mg, and Mg is hydrogenated after the formation of CeHx. This disproportionation reaction is irreversible, but the Ce_2Mg_{17} alloy after disproportionation reaction is still reversible. The amorphous structure formed in rapid solidification is in favor of CeHx decomposition. The disproportionation reaction improves anti-sintering properties and cycling stability. Ce_2Mg_{17} system shows promise to solar power thermal energy storage.

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Study on properties of nanosilica/skim rubber composites

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The influence of nano-silica on the properties of Skim rubber composites was investigated. When the nano-silica particles were using method of using blends of latex into rubber, the 300% extension stress and aging properties increased evidently with increasing nano-silica amount from 5 to 20 phr. Scanning electron microscopy (SEM) observations of the Tensile fracture surface showed that some apparent nano-silica particles were left on the surface of the composite, which strongly suggested that the nano-silicon particles were small and that interfacial adhesion between the nano-silica and rubber was relatively high. To improve the dispersion of the nano-silica in the rubber matrix, nano-silica/Skim rubber master batches were prepared by a latex compounding method. With nano-silica/Skim rubber master batches, no holes of nano-silica particles were left on the surface, this suggested that the interfacial strength was improved because of the fine dispersion of nano-silica, Mechanical properties and aging properties have a significantly improved. The composites exhibits excellent thermal performance, glass transition temperature (Tg) increased according to thermal properties test. Under different strain, Curves of G' versus and tanδ are different, more precisely, G' decreased and tanδ increased with increasing silica loading, while Under different temperature, Showing the opposite phenomenon.

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