

Article

Corrosion resistance of aluminium against salt hydrates used for latent heat storage by using different coating materials

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Abstract: Thermal energy storage (TES) is required when using energy sources that are intermittent in order to fill the gap between energy supply and energy demand. Latent heat storage systems are based on phase change materials (PCM) such as salt hydrates, which absorb and release thermal energy with a change in its physical state. However, even though salt hydrates are widely used as PCM, they are potentially corrosive. Since PCM are normally encapsulated in containers, the compatibility with each other has to be assessed in order to create resistant containers. In this work, corrosion resistance of aluminium against two different salt hydrates (SP24E and SP50) in a temperature range of 40 °C to 60 °C was tested. Furthermore, four coatings (anodized, electroless nickel-phosphorous, powder and KTL-cathodic dip) were used to enhance the aluminium corrosion protection. The method used was the immersion corrosion test. Signs of severe localized corrosion were found in uncoated and nickel-phosphorous coated aluminium, while the anodized coated aluminium showed slight uniform corrosion. According to the calculated corrosion rates uncoated aluminium is not recommended to be used for long-term applications when using SP24E as PCM, as well as nickel-phosphorous coated aluminium when using any of the two tested salt hydrates.

Keywords: latent heat storage; phase change material; aluminium; coating; salt hydrate; corrosion rate
