Immersion Test of Pure Nickel Cladded 316H steel in KCl-$MgCl_2$ Molten Salt at 650 °C

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1. Introduction

The experiment involved conducting a 100-hour immersion test using the Gas Tungsten Arc Welding (GTAW) method to apply nickel coating to Stainless Steel 316H [1]. This was done to evaluate the corrosion resistance of Stainless Steel 316H enhanced by nickel coating. Such experiments are relevant for the development of materials to be used in high-temperature molten salt environments, such as Molten Salt Reactors (MSRs). The results of the experiment would indicate whether nickel coating successfully improves corrosion resistance and how such treatment may impact material performance in high-temperature molten salt environments. This research is crucial for enhancing the safety and performance of reactor facilities like MSRs.

2. Methods and Results

The samples with exposed nickel surface layers using cement adhesive are immersed for 100,200,300 hours in high-purity NaCl+MgCl2 salt contained within a glove box where moisture and oxygen are controlled to be below 100 ppm [2,3].

The samples were coated with nickel wire and then immersed in the molten salt. After 100, 200 and 300 hours of immersion, the samples were removed, and the rates of area and weight loss were measured.

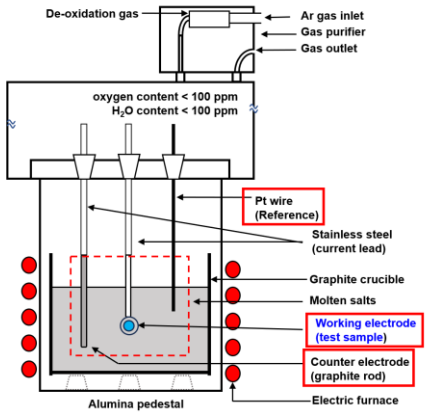

Fig 1. Schematics of glove box

Fig 2. Sample with ceramic cements

3. Conclusions

This experiment is crucial for determining the nickel cladding method in high-temperature molten salt environments. It measures the erosion rate of the material's area and weight at intervals of 100, 200, and 300 hours. This plays a vital role in assessing material suitability. The erosion rate data contributes to analyzing the durability and changes of the material. This information provides important guidance for material selection under extreme conditions. Additionally, these results are key in setting the direction for future material development and research.

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