Effect of Cr-C Coatings on the Corrosion Resistance of 304 Stainless Steel in the Molten Sodium Polysulfide

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The corrosion of metallic containers in Na-S batteries cause an increase in resistance, a loss of battery capacity and cycling life limitations. In this paper, a Cr-C coating was deposited on 304 stainless steel by a direct current magnetron sputtering technique. XRD analysis showed that the as-deposited Cr-C coating mainly consisted of Cr₃C₂, Cr₇C₃ and Cr. After corroding in molten sodium polysulfide at 350°C for 100 h, NaCrS₂ and Cr₂S₃ were generated on the surface of the coating. The charge transfer resistance of this Cr-C coating was higher than that of 304SS by approximately 3 orders of magnitude, showing improved corrosion resistance.

Keywords: Sodium sulfur batteries; Container; Cr-C coating; Electrochemical corrosion behaviour; Direct current magnetron sputtering

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