
In situ growth of Ni@MOFs pre-treatment coating to enhance hydrogen barrier and corrosion resistance of epoxy resin

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Abstract: Preparation of hydrogen barrier coatings on pipeline surfaces is a key strategy to achieve safe hydrogen transport. However, existing research predominantly focuses on the physical shielding effect provided by the coatings. In this study, we utilised electrodeposition and hydrothermal methods to prepare an in situ-grown Ni@MOFs pre-treated coating to enhance the hydrogen barrier resistance of conventional epoxy resin. The Ni@MOFs coating demonstrates superior hydrogen barrier resistance with a hydrogen diffusion coefficient of $3.92 \times 10^{-7} \text{ cm}^2/\text{s}$, which is attributed to the physical shielding effect of Ni coating as well as the active hydrogen trapping function of MOFs (utilising van der Waals adsorption of hydrogen molecules and bonding of metal ions or organic ligands to hydrogen atoms). This work provided significant inspiration for developing composite coatings for hydrogen transportation pipeline protection and hydrogen energy utilization.

Keywords: Ni coating; MOF; Corrosion resistance; Hydrogen resistance; Epoxy.