Nano metal-organic frameworks towards the high-performance anticorrosion epoxy resin coatings

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Abstract Metal-organic frameworks (MOFs) have been extensively utilized in the development of high-performance anticorrosion organic coatings. Specifically, MOFs are prepared using imidazolate organic ligands and the coordinated transition metal. The inclusion of the imidazole group not only enhances the barrier property of the coating through improving the crosslinking with the epoxy group but also the effectiveness as an inhibitor to metals when decomposed into the ligand.

In this work, novel aminated MOF nanoparticles are designed based on the ZIF-8 and using the 2-Aminobenzimidazole (2-ABI). The proportion of 2-ABI within the imidazolate organic ligands led to nanoparticles in various sizes and active hydrogen content, consequently influencing the reaction between the MOF nanoparticles and epoxy resin. The epoxy resin coating modified by MOF nanoparticles containing 15 % 2-ABI (ZA-15/EP) exhibited the most effective corrosion resistance during prolonged immersion in NaCl solution.

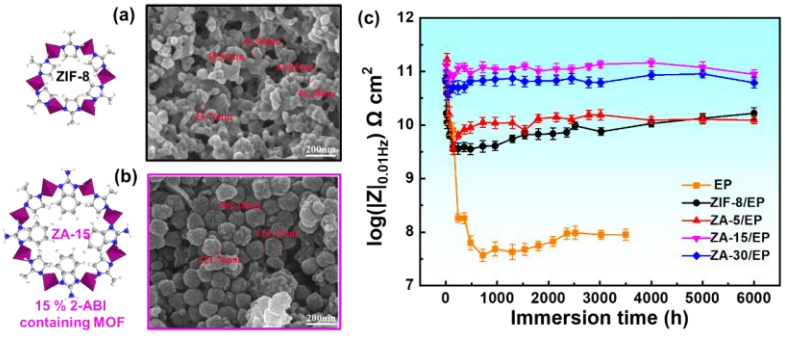

Figure 1. SEM image of ZIF-8 (a), 15 % 2-ABI containing MOF (ZA-15) (b) and (c) impedance moduli at 0.01 Hz ($|Z|_{0.01Hz}$) as a function of immersion time in 3.5 wt. % NaCl solution.