Effect of different zirconium-silicon ratios on the heat resistance of anticorrosive zirconium-modified silicone coatings

Rong Wang, Mei Yu*, Jianhua Liu

[1] *Beihang University, Beijing 100191, China*

yumei@buaa.edu.cn

Abstract: Metal corrosion brings serious safety problems and huge economic losses and is a natural process that needs to be inhibited. The main strategy to mitigate this process is the application of protective coatings, most of which are organic coatings. Compared with similar carbon-based polymers, the main chain of silicone resin is connected by silicon-oxygen bonds, which have higher bond energy, are more stable. However, silicone coatings fail at temperatures of 400°C and above. At present, the main methods for high-temperature resistance modification of silicone resins include doping with heat-resistant fillers and introducing heat-resistant heteroatoms into the main chain. Among them, introducing heat-resistant heteroatoms into the main chain can increase the bond energy of some bonds in the main chain without introducing other phases and improve the heat resistance of the coating.

This paper mainly studies the effect of different zirconium-silicon ratios on the heat resistance of anticorrosive zirconium-modified silicone coatings. Using zirconium n-propoxide as the zirconium source, heat-resistant heteroatom zirconium is introduced into the main chain to form zirconium-oxygen bonds. However, if too much zirconium is added, the self-polymerization rate after hydrolysis is fast, consuming the zirconium, which is not conducive to the improvement of the heat resistance of the coating. Therefore, trying different zirconium-silicon ratios is necessary. The optimal zirconium-silicon ratio for improving the heat resistance of zirconium-modified silicone coatings is obtained, and the influence mechanism of the introduction of zirconium atoms on the high-temperature resistance of the coating is revealed. This has important research value for preventing the corrosion of metal materials under high temperature and high humidity conditions and the comprehensive selection of coatings.

Keywords: Zirconium-silicon ratios,Silicone coating,Heat resistance,Anticorrosive

Reference

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