

Development of a Polycaprolactone Microcapsule to Improve Self-healing Coatings

Morakot
WATTANACHAIYAPHONG^{*(1)}

Chanya
WATCHARANANTADEJ^{*(2)}

Hidehiro YAMAGUCHI^{*(3)}

Abstract

The polymer Polycaprolactone (PCL) is well-known as a functional material which has thermal responsive shape-memory properties. However, it only dissolves in organic solvents. Therefore, its use is limited to water-based coatings. We have developed a new water-based additive called PCL microcapsule that encapsulates Benzotriazole (BTA) *via* an emulsion solvent evaporation process. BTA is an organic corrosion inhibitor and is encapsulated in our PCL microcapsule to enhance corrosion resistance for pre-treatment films. The new water-based additive delivers an inhibitor function to resist corrosion reaction at damaged sites such as scratches or cracks on pre-painted galvanized steel sheet. The film formed incorporating this additive showed not only outstanding anticorrosion superior to chromate coating but also good paint adhesion property on the galvanized steel sheet. The thermal self-healing mechanism of the developed PCL microcapsule needs external heating above its melting temperature to become liquified and recover the coated film. Based on the results from our study, smaller particle size and higher concentration of the PCL microcapsule performed the key role to enhance anticorrosion property well. Moreover, BTA-encapsulated PCL microcapsule can improve anticorrosion at cross-cut (X-cut) area on pre-painted galvanized steel sheet.

^{*(1)}Technical Assistant Manager, Development & Support, Parker Surface Technology Asia Pacific Co., Ltd.

^{*(2)}Technical Chief, Development & Support, Parker Surface Technology Asia Pacific Co., Ltd.

^{*(3)}Managing Director, Parker Surface Technology Asia Pacific Co., Ltd.