CONTROLLED RELEASE OF INHIBITORS FROM COMPOSITE ORGANIC COATINGS: A “GREEN” WAY OF CORROSION PROTECTION

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ABSTRACT

For many decades chromate based organic conversion coatings were used to protect metal against corrosion. In fact this was the first “self-healing” coating which found a wide application field in the steel, aeronautics and automotive industries. Despite the outstanding self-healing performance of chromate based organic conversion coatings its toxic and carcinogenic properties led to a ban. Hence, there is an urgent need for alternative concepts, which are economically and ecologically viable. Here we will show that organic composite coatings containing cyclodextrins (CDs) are promising for intelligent corrosion protection. To date, CDs are mainly used for pharmaceutical drug delivery in the human body. They are non-toxic. We successfully complexed different corrosion inhibition agents with CDs and investigated the self-healing properties of coatings containing the resulting complexes. The complexation of inhibitors into the CDs allows the controlled release by electrode potential and pH-change during the corrosion process of the metal. Controlled release and self-healing properties were investigated with a number of different techniques, including Scanning Kelvin probe. Thus, cyclodextrins may develop into a harmless and "green" system for corrosion protection of metals.