GEMSEC SRD SEMINAR

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Milnor-Roberts Room, Wilcox 243, MSE Department

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Formation of Calcareous Deposit Films by Electrodeposition in Natural Seawater and their Applications

Sea occupies almost three quarters of the Earth's surface and contains various kinds of chemical ions. Ironically, although some of these chemicals are corrosive for metals some others can be very useful to protect metal from corrosion by means of electrochemical techniques.

The formation principle of electrodeposition films in seawater is to lower the potential of the metal to a more negative value by impressed cathodic current. That is, the electrodeposited films are formed by pH increase or OH^- generating reactions at the metal surface via cathodic current. High pH values causes precipitation of magnesium hydrate ($Mg(OH)_2$) and calcium carbonate ($CaCO_3$) which are the main composition of electro-deposit films. It's obviously has several advantages compared to the conventional coatings, since the environment-friendly calcareous deposits is formed from the elements (Ca^{2+}, Mg^{2+} etc.) naturally exists in seawater. Especially, these deposit layers are very useful part in controlling the corrosion of ferrous metals exposed to seawater. These calcareous deposits are believed to promote a physical barrier against oxygen diffusion and thus decrease the corrosion rate in seawater.

However, there are some difficulties to maintain both a corrosion resistance for a long period of time and a strong adhesion between deposits and base metal.

On the other hand, $Mg(OH)_2$ brucite crystal were densely formed on specimens by rich Mg^{2+} ions from AZ31 anode in electrodeposition process and it have strong adhesion between deposit films and metal substrate, as evidenced by experiments.

Here in this seminar, the concepts on formation process of electrodeposited films in seawater will be explained, and moreover the application techniques of electrodeposited coatings under seawater environmental conditions will be mentioned.