Corrosion Resistant Coatings with Self-Healing Properties.

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Why self-healing coatings are necessary?

Direct economic costs of corrosion, which include material preparation and the labor costs for prevention and repair. There are also a large number of indirect economic costs associated with corrosion, which include plant downtime, loss of product, loss of efficiency, contamination and overdesign. Those costs are harder to estimate and they may even have a larger impact than direct costs. Besides economic costs, corrosion also takes a significant cost in human life and safety. Oil leakage caused by corrosion may contaminate drinking water and therefore impair human health. Serious corrosion may even cause explosion, thus resulting in significant life loss.

The presently used methods for corrosion resistance include galvanization, cathodic protection or using paint are temporally effective. Self-healing technologies which heal either autonomously or by applying some external conditions could significantly increase material/system reliability, reduce life cycle costs, and improve operational safety.

How does the coating work?

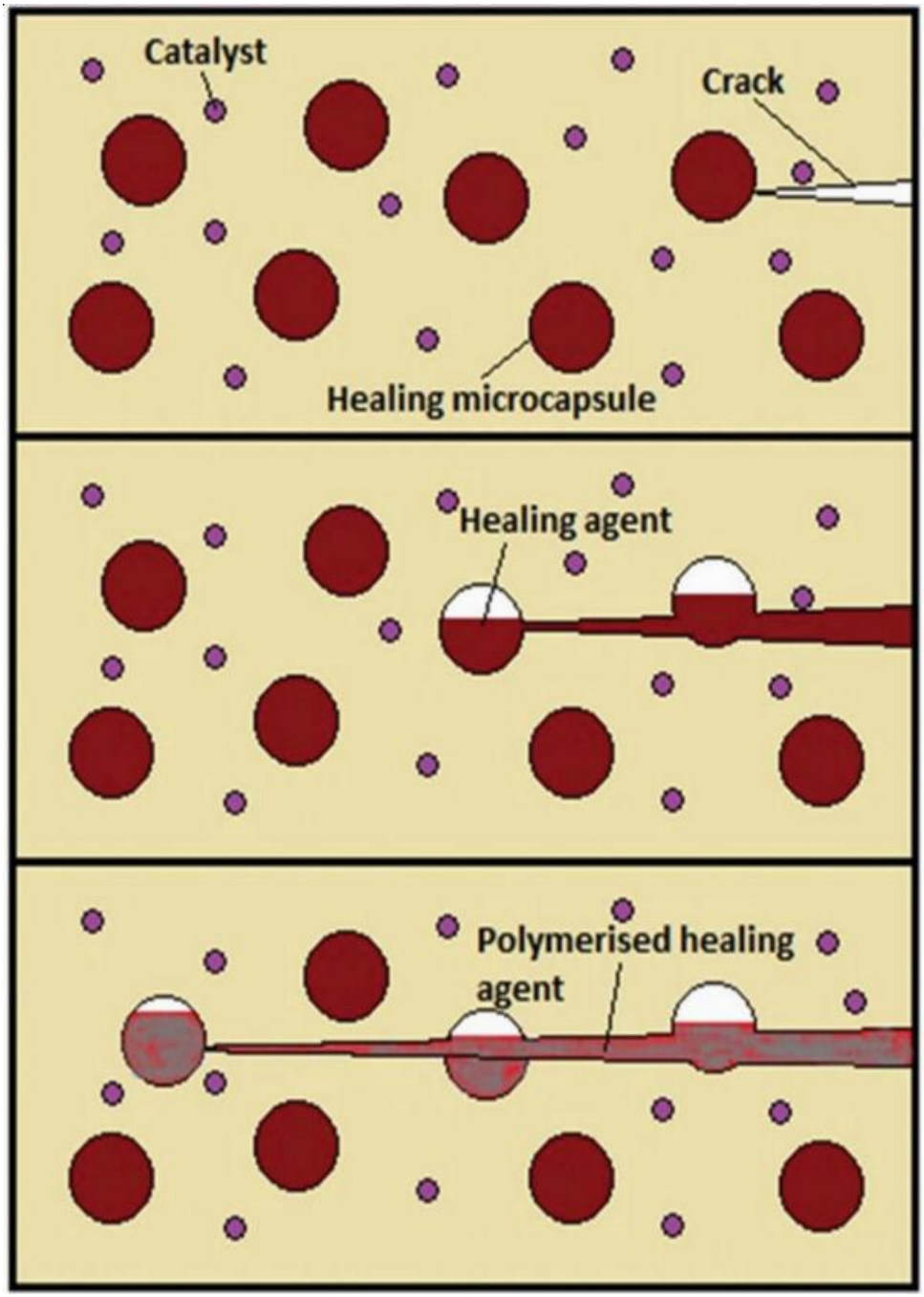
Microcapsule based self-healing coatings are the common ones. A certain polymer is filled inside micrometer or nanometer sized capsules and the capsules are embedded in a matrix. As a crack propagates through the coating, it ruptures some of the capsules, the polymer comes out and reacts with the materials in the matrix to polymerize and fill the gap caused by the crack and hence the crack vanishes.

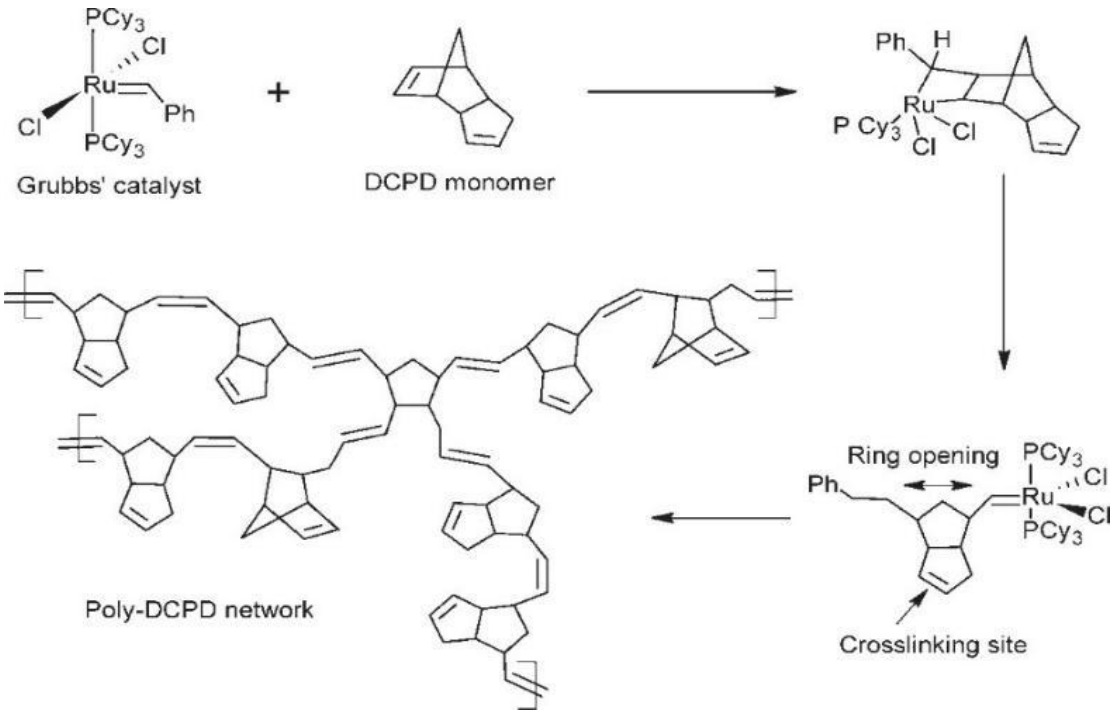
Another one is the vascular based self-healing coatings. These work in the same way, but instead of capsules, there are micro tubes filled with polymer. There is a continuous supply of polymer to the damaged spot, so they are capable of performing upto 10 healing cycles while the capsules have only 1 cycle. DCPD, was used as an experiment with Grubbs Catalyst to make self-healing coating.

Further study to augment the traits of coating are carried out, which include Self Reporting coatings. Crystal violet lactane is a color indication dye being used in such coatings. In order to make the coatings environmental friendly and economical, Graphene Oxide – Linseed Oil and polyaniline-Sodium Alginate based coatings are also used.

CONCLUSION-

Self- healing coatings cannot cure corrosion prone areas very efficiently. There are some things that need to be developed more, like making coatings completely hydrophobic, reducing the cost and ensure proper adhesion, but we can say these coatings can help us save a lot of money that goes into treatment of corrosion.


Catalyst
Crack
Healing microcapsule
Healing agent
Polymerised healing agent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Crosslinking site
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