Stimuli-Responsive Nanocarriers for Self-Healing in Corrosion Protection

L.P. Lv, K. Landfester and D. Crespy*

Max Planck Institute for Polymer Research, Ackermannweg 10, 55128, Mainz, Germany – e-mail: lv@mpip-mainz.mpg.de, landfest@mpip-mainz.mpg.de, crespy@mpip-mainz.mpg.de

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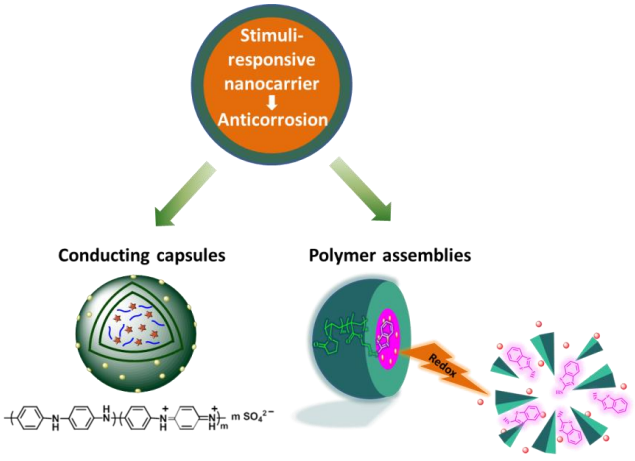
ABSTRACT

A carrier system is efficient if distinct payloads can be selectively released *via* different stimuli because unwanted and unspecific release can be avoided. For anticorrosion, the wanted carrier system is the one able to release its self-healing agents or corrosion inhibitors upon change of pH- or/and redox-potential due to the variation of these two signals at the corroded sites.

Polymer assemblies loaded with hydrophobic payloads are prepared *via* self-assembly of amphiphilic copolymers in water. The amphiphilic copolymers are designed to bear a corrosion inhibitor as cleavable side group. The release of the hydrophobic payloads is triggered by reductive cleavage of the copolymer, leading hence to the co-release of the corrosion inhibitor. This property makes the present system advantageous to other polymer assemblies in which the cleaved unit usually exhibits no functionality. As another stimuli-responsive carrier system, polyaniline (PANI) capsules loaded with two different corrosion inhibitors are synthesized *via* a one-pot miniemulsion polymerization and then a surface modification. Unlike previous systems where both payloads are released together, the two corrosion inhibitors could be released selectively and independently by activating the capsules with either pH change or chemical reduction.

Based on the fact that the local condition of the corroded sites provides a change in pH or redox potential, the stimuli-selective release of the multi-payloads makes the nanocarriers promising candidate for corrosion protection.



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