**Multifunctional polymer micro- and nanocontainers used as active feedback protection in anti-fouling coatings**

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Biofouling is the accumulation of sessile aquatic organisms on surfaces exposed to water. It is a major problem for ships as the increase in mass and flow resistance leads to a decrease in speed and higher fuel consumption. Another problem affecting also static structures is the bioinduced corrosion.

The common approach to circumvent biofouling is the use of anti-fouling coatings. Until very recently these coatings contained Tributyltin and Triphenyltin, highly toxic and environmentally hazardous compounds, which have been banned worldwide nowadays, leading to a demand for new solutions in biofouling inhibition. Today, two main types of anti-fouling coatings exist, both exhibiting certain drawbacks.

The first uses less harmful biocides directly embedded into the coating matrix. Yet, often the interaction between biocide and matrix impairs the barrier properties and integrity of the coating. This, in turn, causes an uncontrolled release of the biocide leading to a smaller concentration of active agent and consequently a decrease in protection efficiency and life time. As a result, currently applied coatings lose the impregnated anti-fouling agent within 4-5 months.

The second approach is based on smooth surfaces preventing aquatic organisms from adhesion, hence bypassing the problem of undesirable biocide-matrix interaction. However, this solution is restricted to mild conditions. As soon as the coating is mechanically damaged, biofouling will rapidly spread.

The new approach proposed here is capable of overcoming the drawbacks of the aforementioned methods. The main principle is to fill the active agent in micro- or nanocontainers to avoid uncontrolled release. When these containers are implemented into the coating matrix they show a significantly smaller influence on the coating stability, thereby retaining its barrier properties. In addition, they possess a sensitive polymeric shell which provides the coating with the capability of an intelligent performance as the release of the encapsulated active materials can be controlled upon action by external stimuli. Consequently, the container-based coatings will reduce the environmental effect of biocide release and, at the same time, decrease maintenance costs.