Influence of Deacetylation Degree of Chitosan on the Anticorrosive Properties of Carbon Steel Coatings

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Abstract.
Important economic losses in petroleum, aerospace and automotive industries represents a major problem due to corrosion of metals in aggressive medium; carbon steel is widely used for different purposes due to its endearing properties (hardness, durability, ductility, low cost, handiness) [1]. Therefore, non-toxic, cost-effective and eco-friendly strategies are needed to protect metallic surface of steel [2]. Due to their compatibility with the natural ecosystem, abundance, and multiple adsorption sites, natural biopolymers could be used as a better alternative for toxic synthetic corrosion inhibitors. Against this background, the anticorrosion coating performance of chitosan, from three different commercial sources, as single component, on carbon steel in chloride solutions was investigated using electrochemical impedance spectroscopy (EIS) technique.
The present study was performed to evaluate the corrosion protective abilities of a green inhibitor, chitosan, in order to determine the relationship with its deacetylation degree (DDA), evaluated by potentiometric titration, a simple and reliable method. The degree of deacetylation of chitosan is one of the main characterizing parameters which determines their physical, chemical and biological properties (electrostatic characteristics, self-aggregation, sorption properties, and ability to chelate metal ions). Depending on their DDA, the experimental results indicate that is a remarkable difference between different chitosan samples regarding the value of the charge transfer resistance of chitosan coating on steel.

References.
[1]. Balaji J., Sethuraman M.G., *Internat. J. of Biological Macromol.* 2017, *104*, 1730
[2]. Saviour A. Umoren, Abdullah A. AlAhmary, Zuhair M. Gasem, Moses M. Solomon, *Internat. J. of Biological Macromol.* 2018, *117*, 1017