ZnO-Containing Chitosan/Gelatin Coatings for Corrosion Protection of Stainless Steel

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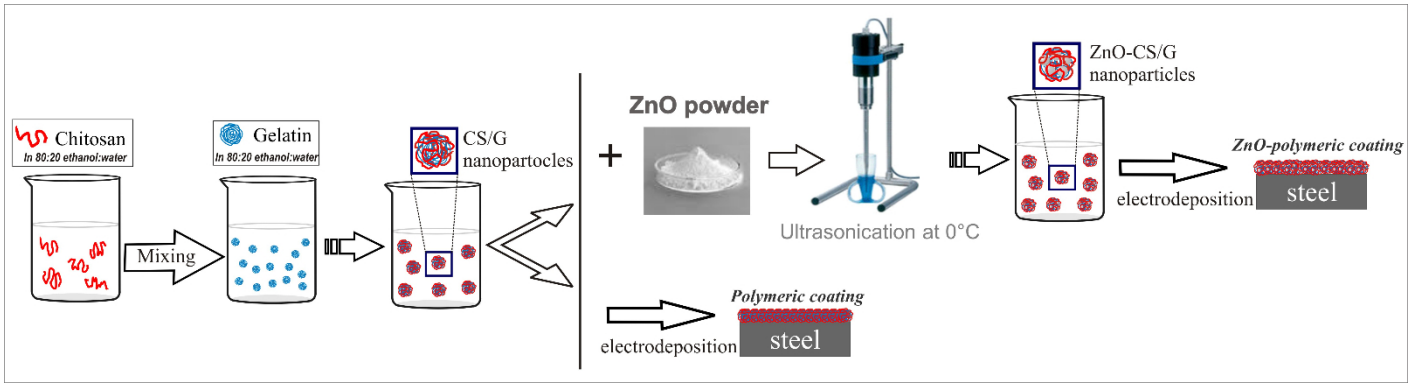
Surface modification of stainless steel is an effective approach for improving its corrosion resistance in aggressive media. In the present study, ZnO-containing chitosan/gelatin coatings were deposited on stainless steel by electrophoretic deposition (EPD). The coatings were obtained from stable water–ethanol suspensions of nanoparticles formed through chitosan/gelatin complexation in the presence of ZnO. The use of a water–ethanol medium was intended to minimize undesirable water hydrolysis during the EPD process. Dynamic light scattering and electrophoretic measurements were employed to determine particle size and zeta potential. The morphology and elemental composition of the nanoparticles and the deposited coatings were characterized by scanning electron microscopy (SEM). The corrosion behavior of coated and uncoated stainless steel specimens was evaluated in PBS buffer (pH 7.4) by polarization resistance measurements over a period of 60 days. For comparison, ZnO-free chitosan/gelatin coatings were also studied. The results demonstrated that the incorporation of ZnO significantly improved the corrosion resistance of stainless steel compared with both the bare substrate and the ZnO-free coating.



Schematic illustration of the preparation of chitosan/gelatin and ZnO-containing chitosan/gelatin coatings on steel by electrophoretic deposition.

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