# MODIFICATION OF THE INORGANIC-ORGANIC SILICA COATINGS BY ACTIVE AGENTS AND ITS INFLUENCE ON LONG-TERM PROTECTION OF P265GH STEEL

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**ABSTRACT:**

Corrosion is a worldwide major problem that is responsible for enormous financial losses and despite numerous attempts to create effective and durable prevention methods, still needs to be addressed [1]. One of the most commonly used methods to protect metallic substrate is to create a coating. Today's science offers many different techniques to create coatings which successfully protect metallic surfaces [2]. Moreover, modern markets are advancing coating methods that not only guarantee efficient anti-corrosion protection but are also environmentally friendly. Hence such traits such as zero waste and being beneficial in terms of energy consumption are also factors necessary to consider when choosing a coating method process. Among "green methods" there is the sol-gel method, which gives the ability to obtain a product with controllable specific properties on a molecular level. Over the past years, improved control of the sol-gel process and further development of offered products triggered growth of the sol-gel coatings market [3]. Using the sol-gel method, it is possible to create various coatings providing long-term protection: by adding powders and nanopowders, nanocontainers, active polymers, etc [4]. Nowadays, the most successful sol-gel system for long-term protection consists of oxide sol-gel networks modified by active agents i.e., $CeO_2$ or $ZrO_2$ [1].

In this work, the silica sol-gel coatings based on 3-glycidoxypropylrimethoxysilane (GPTMS), 3-aminopropyltriethoxysialne (ApTEOS), zirconium butoxide (ZrOBu) and active agents ($Ce(NO_3)_3$, $CeO_2$ and benzotriazole) are presented. Silica coatings on low carbon steel (P265GH) were tested for corrosion protection in 0.5M NaCl, 'self-healing' ability was examined by extending the time of exposure to corrosion agent (using EIS and LPR methods). Additionally, the SEM with EDX was used to characterize the morphology and chemical composition of coatings. The scratch test was conducted to determine mechanical properties like adhesion and friction.

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