DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

(State the objective of the project, describe the basic research to be carried out, and present reasons for choosing the research topic - max. 2 standard type-written pages)

The main goal of the project is the preparation of high-temperature corrosion resistant Si-C-O layers on steel substrates. These coatings will be obtained by pyrolysis of unfilled polysiloxane network coatings fabricated previously on the substrates using controlled cross-linking reaction. We expect that the use of appropriately selected siloxane reagents in this process will result in the layers with high cross-linking densities. Controlled pyrolysis (i.e. carried out at proper temperature value and under appropriate temperature regime developed in the project) of such precursors should result in impervious (i.e. crack- and pore-free) Si-C-O layers showing good adhesion to the substrate. Imperviousness of Si-C-O layers is the main factor which decides on their effectiveness in corrosion protection of steel substrates. Another goal of the project is preparation of Si-C-O coatings of various, controlled compositions. This will be achieved by using reagents containing various amounts of hydrocarbon groups within their molecules in cross-linking processes. We expect that pyrolysis of the obtained polysiloxane networks will result in coatings consisting of silicon oxycarbides, differing in stoichiometry, and various amounts of free carbon. Research conducted within the project, will make it possible to determine impact, that composition of the Si-C-O layers has on their high temperature anti-corrosion properties.

Investigations performed in the project will expand existing knowledge on the fabrication of coatings from cross-linked polysiloxanes on substrates. It will also develop completely new knowledge on the impact that composition of the polysiloxane network, obtained by hydrosilylation, have on producing homogeneous and well adhering Si-C-O layers. Additionally, new insight on the pyrolysis of Si-C-O coatings obtained from polysiloxane networks will be obtaind. Most importantly the properties of protective Si-C-O coatings, particularly on high-temperature corrosion resistance of such coatings on steel substrates in oxidative environments will be investigated and correlated with coating preparation parameters. Thus, the proposed studies fully comply with the criteria of basic research.

The main reason for choosing this topic of research is the complete lack of information on obtaining Si-C-O coatings from the polysiloxane by controlled cross-linking reaction on steel substrates, as well as on the protective properties of these coatings. However, from the literature data (cited in the proposal), it is known that solid Si-C-O materials have excellent anti-corrosive properties at high temperatures in atmospheres of oxidizing gases. Additionally, laboratory facilities (located in the department in which the project will be carried out) allow the execution of all phases of work related to obtaining layers, as well as their subsequent characterization and analysis. These experiments will be carried out by a team specializing in this type of research. An important advantage is the extensive experience of project manager in this field. Previous studies are summarized and described in manager's PHD thesis "Preceramic polysiloxanes obtained using hydrosilylation process" and in several publications.