Barrier properties and wear performance of sol-gel coatings obtained from metal alkoxides precursors

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This study aims at developing sol-gel coatings, on different metallic substrates in order to improve their friction and wear resistances in the field of transport industrial sector applications. This work is performed in the framework of TRANSPORT project of INTEREG program (INTEREG V, France-Wallonie-Vlaanderen), funded by the European Regional Development Fund (ERDF).

Wear resistance of sol-gel coatings and their barrier properties can be affected by three main parameters[[[1]](#endnote-1)]: (i) the chemical composition of the solution (inorganic, hybrid or mixture of both hybrid and inorganic precursors), (ii) the processing parameters and application methods (drying and curing, thickness, densification) and (iii) the substrate (metals, ceramics, polymers…etc.).. The most common metal precursors used in sol-gel chemistry are silicon and M-O-R alkoxides, where R refers to H, alkyl, aryl or alkoxy and M to metal element (Zr, Ti, Al, Zn, W…etc.). The addition of certain elements to the sol such as nanoparticles (metal oxides, carbon nanotubes, clay minerals, corrosion inhibitors…etc.), hydrophobic compounds, dispersants, copolymers and lubricant agents can be used to improve the stability of the sol and the final properties of sol-gel coatings.

This study focuses on the correlation between barrier properties and wear resistance, of sol-gel coatings obtained from Si-alkoxides in non-aqueous solutions (ex: TEOS, GPTMS and MTES). The effect of additives to the formulation (dispersants and lubricants agents) and processing parameters (drying and curing) on the barrier properties and wear resistance will be presented and discussed.

1. [] C. J. Brinker and G. W Scherer, Sol-Gel Science, 1990. San Diego: Academic Press. [↑](#endnote-ref-1)