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HIGH-TEMPERATURE CERAMIC COATINGS WITH GEOPOLYMERIC BINDERS

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High-temperature (HT) resistant coatings represent an updating subject of high industrial interest on account of their relevant applications (turbines, engines, aeronautic, ecc.). While many HT resistant products are known, not simple appears to satisfy the requirement of their high and stable adhesion on the support.

The aim of this work was to develop novel HT resistant ceramic coatings based on silicon carbide and/or zirconium oxide, using geopolymeric resins as binders. Geopolymers show many advantages respect to organic polymers, first of all their high heat resistance and refractoriness. Moreover, they are fully inorganic, do not require organic solvents and are not off-gassing. During the geopolymerization step, the polymineral resin (alumino-silicate binders) is formed, acting as glue sticking together the unreacted Al-Si source materials and fillers (ceramic powders), forming the ceramic-geopolymer composite coatings.

In order to optimize the geopolimeric binders, different raw materials have been tested (caolins, meta-kaolins and alumina/silica fine powders), while the alkali aqueous solution was KOH/K_2SiO_3, fixing the ratios $SiO_2/Al_2O_3 = 4$ and $SiO_2/K_2O = 2$. Setting conditions, microstructural evolution as a function of the temperature and thermal evolution either in air or inert atmosphere were deeply investigated in order to set-up the best preparation conditions.

HT resistant coatings were prepared by mixing the ceramic fillers (90 wt %) with geopolimeric binders, then applying the obtained mixture on ceramic substrates by brushing. After a first setting, coatings were stabilized by a thermal treatment in inert atmosphere at 1350 °C and then the oxidation behaviour and adhesion level on the substrates were studied. A key role of new glass-ceramic phases formed during the thermal treatments has been evidenced.[1]