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Active metals for the mechanical metallization of oxide and non-oxide technical ceramics

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Abstract – In recent years, studies involving the German and Brazilian team of this work conducted jointly by major progress in the study and development of the mechanical metallization and brazing of structural ceramics including alumina, zirconia and silicon carbide to a variety of metals. Titanium, tantalum, niobium and zirconium, were employed in the step of Metal and alloy addition commercial and VH 780 (Au-Cu) and VH 950 (Au-18Ni) used in brazing. Investigate the characteristics of layers reactive mechanically metallizated on ceramics oxides (alumina and zirconia) and non-oxides (silicon carbide) using is different reactive metals and alloys, including Ti, Ta, Nb, Zr.

The high resistance, high temperatures and corrosion of the ceramics are highly attractive for use in electronic industries, aerospace, nuclear and automobile, the majority of these ceramics require a complex geometry thus limiting some of its properties in applications structural; the evolution of the processes the union has allowed the use of ceramics with metals in the manufacture of various components hybrids expanding the use of such ceramics and the tolerances can be readily get [1-2].

The tools of metal active are engaged to a reworking manual. Samples ceramics are individually prey to a mechanical around to generate is a movement on between the two materials. The parameters of Metal employees were based on previous experience gained by the team with the Metal and alumina ceramics non-oxides with titanium. The rotation of reworking manual was 27.000 rpm, the rotation of the surrounding was 525 rpm and the angle of attack of the tool ranged between 3 and 6. The total time of Metal was 45 s (for zirconium, smaller diameter) and 60 s (for alumina and silicon carbide, larger diameter). Figure 1 illustrates the process of Metallization.

Three alloys were selected for tests VH 780 (Ag-28,Cu), VH 950 (Au-18,Ni) and SCP 2, containing palladium (Ag-31.5,Cu-10,Pd). In each alloy were selected two temperatures above the melting temperature of the alloy, to study the wetting. The timing of the temperature level of study of wetting is 30 min. For each grup of ceramic samples, the surfaces metallizated is placed in contact with the alloy without metal active, cut in the form of ring.

In the brazing were used copper (Cu-ETP) and stainless steel (14571 / X6CrNiMoTi17-12-2) for the joints, in Figure 2 (a) can be observed in the support which was the process of brazing for the ceramics samples (aluminum oxide and silicon carbide) with steel and copper and in Figure 2 (b) used to support the samples of zirconium oxide with ceramics steel and copper.

Figure 1: Process of mechanical metallization

Figure 2: a) Support used for brazing of samples of Al_2O_3 and SiC with steel and copper. **b)** Support of the samples used for brazing of ZrO_2 with steel and copper.

References

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