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Brazing zone structure at active brazing of alumina ceramics

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Nowadays one of the most effective methods of joining of oxide ceramics with other elements of construction is active brazing based on using of active metals (Ti, Zr), which increase reactivity of brazing alloy relative to ceramic element of a joining. However, it is well known that inconsistency between thermal coefficient of expansion and coefficient of elasticity of joined elements can worsen mechanical features of a construction. Particular attention in this case is attained to material of brazing alloy, which can restrict the effect of residual thermal stresses and act as plastic buffer, compensating additional stresses. Consequently, strength of oining is defined by chemical processes occurring in this area and by elastic characteristics of reaction products, produced during brazing. That's why understanding of reaction characters and reaction products in brazing zone is very important for prediction of junction quality.

Searches were done for samples resulted in vacuum brazing of ceramics MK microlite, containing 99.34% Al_2O_3 to CT. 3. Titanium applied on ceramic sample by arc spraying in vacuum used as active metal.

Brazing were done with brazing alloy (Ag-72% Cu-28%) at 850-950℃ and the holding time was 10-30 min. X-Ray diffraction analysis was used to identify reaction products in intermediate layer.

The results of analysis show that occurrence of reaction products in brazing zone is caused by two types of reaction. Titanium reacting with Al_2O_3 produces a thin layer of titanic oxides such as TiO, Ti_3O_5. The second layer is formed in Ti-AgCu zone as a result of reaction between Ti and Cu in brazing alloy. The products of such reaction are $TiCu_4$, $TiCu_3$, characterized by significant brittleness, and very thick layers have a negative effect on quality of joining.

We must underline that the thickness of reaction layer may be controlled by the temperature of brazing and by the holding time.

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