

Dispergation CINETICS Under Annealing in Vacuum Copper Nanofilms Deposited onto Nonmetallic Materials

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Copper coverings onto metal surfaces are widely used in technics for the various purposes, for example, for the products brazing. At the same time it is possible to deposit of copper coverings onto nonmetals, in particular, onto oxides for the same purposes.

Dispergation processes of copper nanofilms by 100 nm thickness which were deposited onto sapphire, nonoxide ceramics (Si_3N_4) and carbon materials (monocrystal SiC, graphite, carbon glass) and annealed in vacuum were investigated at temperatures up to 1100 °C under various time of endurance at these temperatures.

Nonmetallic substrates were small thin plates having sizes 4x3x1 mm. One of flat surfaces of each sample has been well polished up to roughness $R_z = 0,03 \div 0,05$ mcm except for samples from monocrystals SiC in which used the initial raw smooth side. After polishing all samples have been carefully degreased and annealed in vacuum at temperature 1100 °C during 1 h.

On annealed surfaces of samples copper films by 100 nm thickness were deposited by electronic beam, which after had been annealed in vacuum under temperature 800 – 1100 °C.

Annealed samples were investigated with the help of scanning electronic and atomic-power microscopes. As result were received microphotos. With using of these microphotos the islands areas metal onto nonmetallic substrates surface by planimetric method of weighing, i.e. definition of weight of metallized elements surfaces of substrates have been made.

It is established, that copper nanofilms in result of annealing at 800 °C remain practically without changes on all investigated nonmetallic materials even at long annealing. Some changes of morphology copper films are observed at annealing not less than 10 min at 900 °C, and already after 20 min annealing copper films onto all samples essentially dispergate. During increasing of temperature annealing the copper films from 900 °C up to 1100 °C her dispergation it is considerably intensified on all materials.

On the basis of given researches results it is possible to draw a conclusion, that for joining of the investigated nonmetallic materials were metallized by copper at temperatures 800 – 950 °C duration of brazing process should not exceed 15 min, and at 1000 °C it must be no more then 5 min.