

Thin Film Microwave Absorber-Column-like Thermistor Couple Fabricated via Anodizing of Al/WTi for Rectangle Waveguide Calorimeter Sensor

A. Hoha¹,

U. Turavets¹,

A. Poznyak¹,

A. Pligovka¹

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¹Belarusian State University of Informatics and Radioelectronics, 6 P. Brovki Street, Minsk 220013 Belarus

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Abstract: Absorber-thermistor couple was formed by combine barrier anodizing WTi layer and anodizing two-layer system Al/WTi on single pieces of glass substrate. The use of thin film couple can reduce the heat capacity of the calorimetric sensor. Thermistor was formed by anodizing of magnetron sputter-deposited Al/WTi in 0.4 M oxalic acid aqueous solution at constant current density $6 \text{ mA} \cdot \text{cm}^{-2}$, reanodizing in an electrolyte containing 0.5 M boric acid and 0.05 M sodium tetraborate in a potentiodynamic mode by raising the voltage to 380 V, and chemical etching. Thin film microwave absorber was formed by anodizing of magnetron sputter-deposited Al/WTi in 1 % citric acid aqueous solution and chemical etching. The column-like thermistor morphology by scanning electron microscopy on formation conditions were

investigated. The dependence of sheet resistance on the barrier anodizing voltage of metal WTi thin film has been investigated. Thin film microwave absorber with sheet resistance above $100 \text{ Ohms} \cdot \square^{-1}$ was obtained. The calculated temperature coefficient of resistance in the temperature range 20 to 55°C appeared to be negative and rather low $-8.4 \cdot 10^{-3} \cdot \text{K}^{-1}$ for the column-like thermistor. The design of absorber - thermistor couple for rectangle microwave calorimeter and experimental sample have been developed.

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