Changes in structural and chemical composition of carbon-bearing components in porous anodic alumina during heat treatment

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It was shown earlier that composite materials based on ordered porous anodic alumina are widely used in biotechnology [1]. In the present study we aimed to obtain amorphous carbon/anodic alumina composite material with high carbon content by double-sided aluminum anodizing in aqueous solution of tartaric acid at constant current density and investigate the effect of heat treatment on structural and chemical changes in carbon bearing components in the obtained porous anodic alumina. By SEM it was shown that anodic alumina obtained in tartaric acid electrolyte had well-ordered porous structure with the pore diameter about 90–100 nm and the distance between pores about 400–440 nm. By semi microanalysis it was also established that in as-anodized samples carbon content was about 3.2 % (wt.). Results of FTIR spectroscopy indicated the presence of three-dimensional polymeric structures composed by sp^2 and sp^3 hybridized carbon atoms; and sp^2 type threefold coordinated bonds were dominating in as-anodized and heat treated in air at 200–700 °C samples (Figure). The ESR signals with *g* 2.0033 and ΔB = 0.68 mT resulted from electrons localized on the daggling bonds of tetrahedrally and threefold coordinated carbon atoms were observed. After heat treatment at 800 °C the structure of carbon bearing anodic alumina changed significantly. Carbon atoms in sp^2 hybridization were almost completely oxidized; and the ESR signal was caused by electrons localized on the daggling bonds of tetrahedrally coordinated carbon atoms.

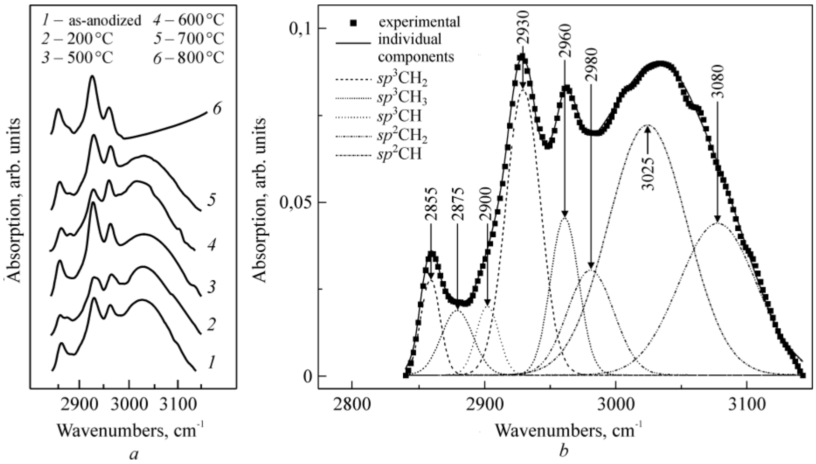

Figure. FTIR spectra of the carbon bearing anodic alumina in the C–H stretching modes heat treated at different temperatures(*a*); the curves are separated to show the details; deconvolution of FTIR spectra on individual components(*b*); maximums in the individual components spectra are marked with arrows

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References

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