Physico-Chemical nanomaterials

The oxidation of carbon nanomaterials: a thermogravimetric study

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The kinetic rules of the carbon materials reaction with molecular oxygen were studied by gravimetry at 825–905 K with using ″coal in a beaker″ model. The reaction constant (k) was found from the experimental data by using a macrokinetic equation [1]:

$$t = t_1 + \frac{(g_1 - g)\left(G - \frac{g_1 + g}{2}\right)}{AC_{O_2}} + \frac{1}{kC_{O_2}} \ln \frac{\mathrm{sh}(h_1)}{\mathrm{sh}(h)},$$

$$\text{where } h = (g - g_0 C)\sqrt{\frac{k}{A^*}},$$

t_1 and g_1 are the time and the sample mass at the first point of the section of the kinetic curve, G, A and A^* are independent parameters, g_0 is weighted mass and g is the initial mass of the sample, C is the mass percentage of a mineral admixture.

The constants were compared for a series of nanomaterials including multiwalled nanotubes (MWNTs), carbon blacks (CB) and diamonds (D). The value of k for MWNTs reaches the constant value in a wide range of the burning degrees. This manifests a uniformity of chemical reactivity. The value of k for MWNTs is highest than that of CB and D.

The samples of MWNTs, CB, and D were characterized by X-ray powder diffraction, SEM imaginary, IR-ATR, TG/DTG, grain size analysis and textural measurements.

1. *Zabuga V. Ya, Tsapyuk G. G., Budarin V.L.* et al. Macrokinetics of carbon oxidation. // Ukr Khim Zh.-2003.-**69.**-P. 22-26.