Raman spectroscopy of activated carbons of various origins

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Activated carbons of different origins have been studied by Raman spectroscopy: disintegrated activated carbon fabric OUT-MI, mineral charcoal SILCARBON TH-90G, charcoal OU-A, the experimental mesoporous activated carbon obtained from the hydrolysis lignin by carbonization and chemical activation (AC), as well as the same activated carbons modified by cellulose sulfate acetate sodium salt (Na-CAS) in the amount of 0.08 g of polymer/g of coal. The structural parameters of the studied samples obtained from the Raman spectra are presented in the table. All the samples have two obvious D and G bands, which are assigned to the disorder of carbon atoms in the graphene layers, crystalline lattice defects and the graphitic structure of carbon materials, respectively [1,2]. Two prominent peaks appear at approximately 1350 cm^{-1} (D band) and 1600 cm^{-1} (G band), which are typical for spectra of carbon materials. The value of R (I_D/I_G) is defined to characterize the disordering degree of carbon materials. According to literature data, while the G-band is characteristic of graphite, the D-band is associated with defects, curved graphite sheets and lattice distortions in carbon structures. Reducing the intensity ratio I_D/I_G for modified samples may indicate a decrease in the number of defects and correlates with the adsorption properties: the value of Gibbs adsorption for methylene blue dye increases when R decreases.

Table. Raman Spectra parameters and specific adsorption for the activated carbon samples

Sample	Peak Intensity Frequency, v_x, cm^{-1}		$R=I_D/I_G$	A, $mmol*g^{-1}$
	G band	D band		
AC	1587	1357	0,988	1,40 ± 0,03
AC- Na-CAS	1592	1360	0,915	1,63 ± 0,03
OUT-MI	1596	1314	1,055	0,86 ± 0,02
OUT-MI- Na-CAS	1592	1313	1,012	1,33 ± 0,03
OU-A	1592	1316	0,931	0,94 ± 0,02
OU-A- Na-CAS	1591	1336	0,908	1,42 ± 0,03
SILICARBON	1587	1357	0,971	1,18 ± 0,02
SILICARBON- Na-CAS	1589	1344	0,959	1,49 ± 0,03

References

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