

# ROLE OF STRUCTURAL NITROGEN IN RED-OX PROCESSES ON SURFACE OF ACTIVE CARBONS

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## INTRODUCTION

In dependence on initial raw materials and production technology the active carbons (AC) except for carbon and hydrogen atoms can contain heteroatoms N, S, P, O, B, etc. At quite high contents of them (>1%) physical and chemical properties of prepared AC such as ion exchange, complexing and catalytic are essentially changeable.

The large interest is caused by N-containing AC, having in comparison with initial analogies more expressed ion exchange capacity and increased catalytic activity at decomposition of hydrogen peroxide and oxidation of some organic compounds by molecular oxygen. The ability of N-containing AC in reductive adsorption of noble and some electropositive d-metals is also marked.

However, the role of N-atoms in red-ox processes with participation of AC is not clear as far as bonded nitrogen can give the set of surface compounds which are responsible for occurrence of novel properties of matrix. So, it is known that increased anion exchange capacity is stipulated, as appear, availability of graphite-like clusters with trailer of N-containing groups of basic type (amines, imides, etc. [1,2]). The new opportunities to research the role of nitrogen has arisen with occurrence of synthetic AC [3,4] which are characterized, on the one hand, by absence of mineral impurities and O-atoms in carbon structure, and on the other, - high starting contents (up to 10 %) of bonded nitrogen in initial carbonaceous material.

## EXPERIMENTAL

It was produced and studied the AC of SCN type prepared from N-containing resin on the base of copolymer 2-methyl, 5-vinylpyridine with divinylbenzene by pyrolysis and following steam activation.

The study of energetic states of N-atoms was carried out by X-ray photoelectron (XPE) spectroscopy (IEE-15, "Varian").

Influence of N-atoms on carbonaceous framework was evaluated on the base of quantum chemical calculations of model clusters which were represented by perinaphthene radical including the N-atoms of various means. The data on energetic characteristics and electronic structure of cluster atoms ( $\pi$ -orbital filling in, charges of atoms) were obtained.

Ion exchange property of AC were investigated by method of potentiometric titration; obtained data were presented in coordinates of "exchange capacity - pH of solution", and after differentiation of corresponding curves it was determined the basic power of exchange centers (pKa). By direct electrochemical measurements it was studied the kinetics of electrode potential formation for AC of SCN type in electrolyte solutions (oxygen gas electrode) up to establishment of stationary significance (Est); it was also determined the zero charge potentials of sorbents (Ezc).

Catalytic properties of AC were investigated in reaction of decomposition of hydrogen peroxide; by means of volumetric method it was defined the constants of  $H_2O_2$  decomposition velocity.

## RESULT AND DISCUSSION

By the XPE-spectroscopy in N-containing AC it was determined the availability as minimum of two energetic states of chemically bonded N-atoms - "pyridine-like" ( $E_1 \sim 399$  eV) and "pyrrole-like" ( $E_2 \sim 402$  eV). The first significance corresponds to arrangement of unshared electron pair on free  $\sigma$ -orbital ( $sp^2$ -hybridization). Second state assumes the arrangement unshared electron pair on  $p_z$ -orbital that predetermines the increased electronic density in  $\pi$ -conjugated system of carbon skeleton. Quantum chemical calculations

