DR-13. EPR SPIN PROBE AND BIOCATALYTIC CHARACTERIZATION OF DIFFERENT SPECIES OF HALLOYSITE MINERAL

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Halloysite is one of the representatives of the group of minerals with prospective adsorption and catalytic properties. Halloysite is close to kaolinite in composition with formula $Al_2Si_2O_5(OH)_4 \cdot nH_2O$ [1] it is a clay layered aluminosilicate mineral containing interlayer water with the most common tubular shape. Over the past 20 years, the number of publications on the properties and prospects for the use of these natural nanotubes has significantly increased, and recently there have appeared several reviews [2–4]. Halloysite nanotubes (gnt) are the dominant form of natural halloysite. In gnt al – oh groups are located on the inner surface of the nanotubes, while the Si–O–Si groups are located on the outer surface, and negative and positive charges appear on the outer and inner surfaces, respectively [4]. Due to its properties and structure halloysite can be easily modified with different functional groups such as carboxyl, aminocarboxyl, thiol, mercapto and phosphonic groups, and finds new areas of application in the process of sorption of dyes, biologically active substances, enzymes and metal ions [2]. Surface modification leads to consequent changes in surface charge, surface electrical potential, local pH inside pores (pH^{loc}), functional groups ionization constants. These characteristics can directly affect many surface-supported processes including heterogeneous catalysis and adsorption processes.

The purpose of this study is to characterize electrosurface properties of pristine halloysite nanoclay and natural halloysite mineral originated from ore by epr spin probe method using pH-sensitive nitroxides and to assess the effect of these properties on catalytic activity of hemicellulase enzyme immobilized on these aluminosilicates in the model reaction of hydrolytic xylan breakdown.

The epr spin probe and biocatalytic characterization of pristine halloysite nanoclayand natural halloysite mineral originated from ore has been performed. The more positive surface charge, the higher activity of both the immobilized enzyme and intrinsic catalytic activity of halloysite material. The highest hemicellulose activity was demonstrated by the enzyme immobilized on halloysite surface by covalent binding with aptes.

References

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