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THE ROLE OF PHYSICAL METHODS IN INVESTIGATION OF METAL-PROMOTED REACTIONS

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In the so-called metal-promoted reactions the role of the metal is to contribute to the progress and development of the given process. The reactions concerning the transformations of the organic reagents involved in the formation of the complexes, will be discussed in this presentation. More attention will be paid to the metal controlled reaction accompanied by:

- assemblage of the organic ligsons into new chemical edifice;
- change of the reactivity of the different functional groups and their transformations;
- redox transformations of the organic reagent;
- stabilization of unusual configurations.

Unlike the catalytic reactions, in the metal-promoted transformations, consumption of the metal is possible, when it is able to form a stable compound with the reaction product. Sometimes the metal ion can be found at the end of the reaction as a component of a newly formed metal complex with an unusual composition and structure. Determination of the composition and structure of the final product using only chemical methods is sometimes impossible, because of unexpected development of the process and deviation from the general chemical standards. In these cases the usual logical conclusions can lead into labyrinth, whence it is difficult to go out. The credible results can be obtained only using a large set of physical methods based on different phenomena, and able to supply undoubted experimental data. The priority in this sense belongs to the X-ray methods for the cases when the suitable crystals are available. Nevertheless the localization de facto of the atoms in molecular structure is sometimes insufficient to judge about oxidation state of the central atom or organic ligand. The spectral methods are more suitable for this purpose. The ESR spectroscopy is used for the paramagnetic systems to establish the localization of the odd electrons and the oxidation states of the protagonists. Some cases when this method gives inadequate data will be presented. The possibilities of the NMR methods for identification of the composition of the complexes, and their priority in the case of diamagnetic compounds, is discussed The role of mass-spectroscopic methods is underlined for the non-crystalline systems. Depending on the ionization sources, this method is used for a large number type of compounds. The possibility to investigate the compounds in gas phase as well as in solutions is an advantage of MS methods.