Abstract of PhD Thesis

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Implementation and development of Solid State NMR methods under Very Fast Magic Angle Spinning.

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The dissertation consists of 3 main parts, which focused on the application of the ultra-fast magic angle spinning (UF-MAS) techniques in structural studies using NMR spectroscopy.

The first part concerns the implementation of the inverse detection techniques in the solid state. This research was connected with improvement of the applied experiment sensitivity and allowed to obtain the information inaccessible in case of other methods. The main aim of the research was an attempt to characterize the host-guest complex structure of 5,10,15-tris(pentafluorophenyl)corrole.

The second part of this work focuses on UF-MAS techniques in dynamics process study. The analysis of such processes is extremely important to understand the crystal structure and in consequences their qualities. In the course of the carried out studies the 2D and 3D CPVC techniques were established which allowed the vital dynamics processes as well as the geometrical properties of molecules to be examined. The designed experiments were tested on the model systems including amino acid and peptides. Additionally numerical simulation was carried out confirming the usefulness and precision of the proposed methods. After completing the research of model systems, I made an attempt to apply these methods in studies of complicated systems such as protein

crystals. The work allowed for the analysis of the dynamics of aromatic side-chains for the first time using example of two small proteins GB-1 and LC-8. Another aspect of the carried out research was combination of CP-VC techniques with the inverse-detection which made it possible to increase sensitivity of the experiment several times.

The last part of the dissertation concerns the application of the UF-MAS techniques in quadrupolar nuclei examination. In my research I got concerned on establishing the possibility of CP techniques application in UF-MAS regime to register ^{27}Al spectra. The carried out examination confirmed the usefulness of the applied methods and allowed to characterize the chosen metallic catalyst supported on the alumina type carrier.

The results were described in 6 original publications in the international journals which are a vital part of the presented PhD thesis. Each of the 6 papers were briefly discussed, however the presented sub-chapter should be treated as an introduction containing description of the ideas and motivation to carry out the research, which were thoroughly described in each publication and will not be discussed here again. The short descriptions which were included in the dissertation do not constitute the abstract or translation of the original publication. The main aim is to present concept of the research.