

## European Network on NMR Relaxometry

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# The influence of therapeutic components on relaxivity of theranostic paramagnetic liposomes

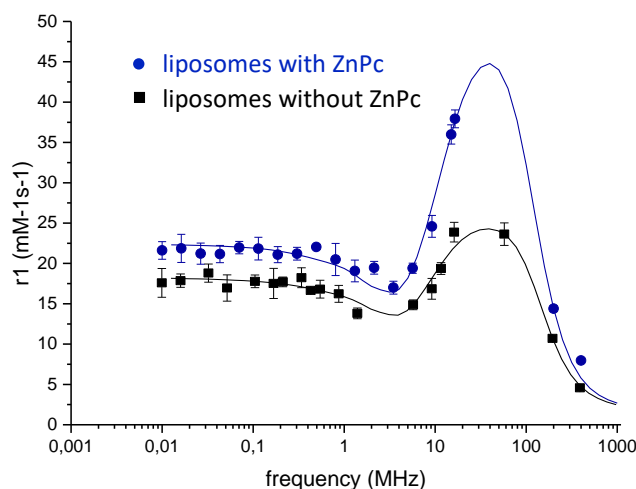
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Bifunctional nanoparticles combining diagnostic and therapeutic functions (known as theranostic agents) are the subject of an increasing number of studies. This group includes liposomes - highly biocompatible spherical particles formed from lipids, which physical and chemical properties can be modified. Liposomes, after appropriate labeling, can be used as contrast agents in many imaging methods. In addition, research on the properties of paramagnetic liposomes that contain a gadolinium (III) ion (Gd (III)) in their structure, as well as therapeutic agents, provide the basis for the preparation of a new generation of nanoparticles. These hybrids, due to their contrasting abilities in MRI (Magnetic Resonance Imaging), allow one to monitor the biodistribution of drugs administered in a human body.

Measurements of NMR relaxation rates in a wide range of magnetic field strengths revealed a positive influence of components of liposomal system, not considered as a contrast agent, on the relaxivity of water protons in the solution. Present in the whole range of the applied magnetic field, an increase in relaxivity caused by the incorporation of ZnPc into the liposomal formulation is shown in Fig. 1. "Modified Florence" approach was used in order to interpret NMRD profiles of paramagnetic liposomes. Comparison of calculated parameters (e.g. water residence time, rotational and translational correlation time of the entire complex) opens the way for understanding the physical basis of the observed relaxation.



*Fig. 1. The r1 relaxivity in function of magnetic field strength for the liposomes with and without ZnPc incorporated (at room temperature).*