

# The influence of magnetic heating on the acoustic properties of magneto-polymer suspensions

Wiktoria Balla,<sup>1</sup> Rafał Bielas,<sup>1</sup> and Arkadiusz Józefczak<sup>1</sup>

<sup>1</sup>*Chair of Acoustics, Faculty of Physics and Astronomy,  
Adam Mickiewicz University in Poznań,  
Uniwersytetu Poznańskiego 2, 61-614 Poznań, Poland*

In this work, suspensions consisting of both polymer and magnetic particles were investigated using pulse ultrasound methods. Using two different types of particles influences acoustical properties of the heterogeneous medium. Additionally, these properties may be altered upon the structural changes such as formation of magneto-polymer aggregates due to heating under an alternating magnetic field. In this process, the magnetic particles become nanoheaters due to dissipation of magnetic energy into Neel and Brown relaxation processes, or into the magnetic hysteresis when particle size exceeds the limit for single-domain particles.

Suspensions with varying concentrations and types of particles were prepared by ultrasonic homogenization and attenuation coefficients and ultrasound velocities were obtained. The results showed that the fusion of polymer particles and the formation of larger structures presented led to a change in acoustic parameters after the magnetic heating. This relationship between magnetically induced thermal effects and acoustic response may be important for applications such as microplastic separation or transport using magnetically responsive fluids.