DESCRIPTION FOR THE GENERAL PUBLIC

Project title: ***Relations between the micro-geometry and sound absorption and propagation in porous and poroelastic media***

Porous media are heterogeneous materials with solid microstructure which contains open or closed voids (pores, channels, etc.) filled with fluid, for example, the air or other gas or liquid. In fact, the majority of common materials are at least to some extent porous. In case of some materials, the total volume of fluid can be much larger than the total volume of solid skeleton.

From the perspective of acoustics and noise mitigation problems, a very important class of porous media are the sound absorbing materials. Those can be various foams or skeletal materials, as well as fibrous or granular media – therefore, in fact, porous media with extremely different kinds of micro-geometry. The common feature of all of them is, however, the open porosity, which allows the noise – in the form of acoustic waves – to penetrate layers of such materials and be to some extent absorbed by them. Therefore, the main application area for such materials are as sound-absorbing liners, and also as lightweight cores for composite structures with good sound insulation properties.

The mechanism lying behind the phenomenon of the energy dissipation of acoustic waves in a porous medium is the interaction between the air particles vibrating in pores and the solid skeleton – rigid or subject to non-negligible elastic vibrations (then, one speaks about the so-called *poroelastic* material). The crucial role in the efficiency of energy dissipation is played by the micro-geometry of porous medium, that is, the shapes and sizes of pores and linking channels, or the shapes and sizes of fibres or grains, and their arrangements. The project aim is a thorough investigation of relations between this usually very complex micro-geometry of porous and poroelastic media of various kinds, and the velocity of propagation of acoustic waves and the extent of their absorption in such media. Porous materials with non-typical micro-geometries will be manufactured and studied in order to state and prove certain scientific hypotheses. Moreover, techniques for identification of micro-geometrical parameters of porous media, based on the acoustical measurements of wave propagation, will be developed during the project, and should become useful in other fields of application than the noise insulation, namely, in bio-engineering, medicine, geotechnics – that is, wherever some porous media are involved.