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Unusually high sound absorption in topological interlocking materials

Yuri Estrin, Andrey Molotnikov, and Mateus Carlesso
Centre for Advanced Hybrid Materials, Department of Materials Engineering, Monash University, Melbourne, Australia

Topological interlocking materials are a new class of architectured materials, which have a range of unusual mechanical and acoustic properties. We present a novel approach for combating noise pollution based on the concept of topological interlocking. Specifically, we propose to segment monolithic plates into an assembly of topologically interlocked building blocks and show experimentally that this leads to a spectacular increase of the sound absorption coefficient over that in the original material, as exemplified by ceramics. Measurements of the airflow resistance confirmed the primary role of segmentation in enhancing sound absorption capability of the material in the audible frequency range. The absorption coefficient was further boosted by design of the material itself. The new material design proposed poses some interesting challenges to theory of sound wave propagation in heterogeneous media.