Vibroacoustic control using polymer-based architectured materials

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Abstract: One of the promising ways to confer new properties to vibroacoustic devices consists in developing architectured materials based on the use of materials which exhibit various behaviors under specific external stimuli. Polymers materials are good candidate for such applications in vibroacoustics since their mechanical properties can be tuned by both proper elaboration procedures (chemical components, reticulation process, forming process) and in-situ stimuli (prestress, environmental conditions). We present here several results which share the same objective that consists in the design of materials and structures for vibroacoustic control: use of shape memory polymers for controlled damping applications, auxetic kirigami structures for wave focusing (collaboration with F. Scarpa – Bristol), PU foams for acoustic absorption (collaboration with N. Attala & O. Doutres – Sherbrooke).

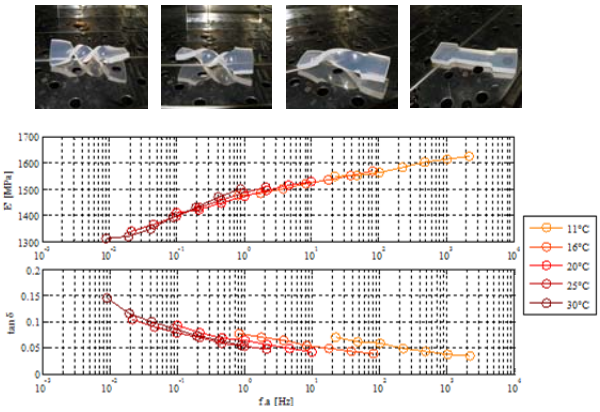

Figure 1: thermo-mechanical characterization of a shape memory polymer
P. Butaud, A. Maynadier, N. Brault, V. Placet, M. Ouisse, E. Foltête, C. Rogueda-Berriet, ICAST 2013

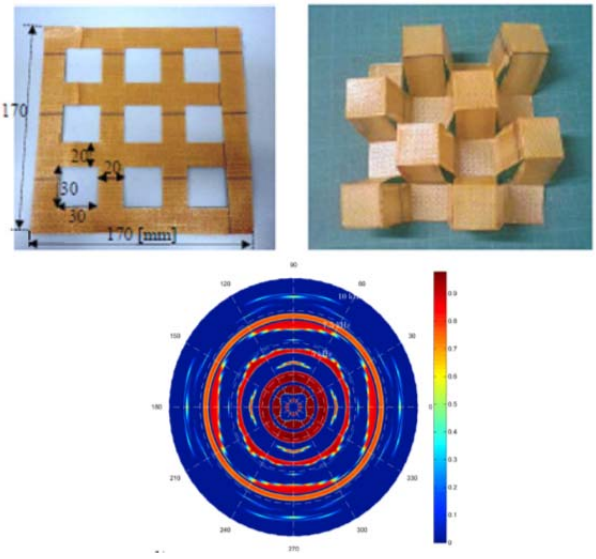

Figure 2: Wave directivity of Kevlar-Epoxy auxetic kirigami structure
F. Scarpa, M. Ouisse, M. Collet, K. Saito, JVA 2013

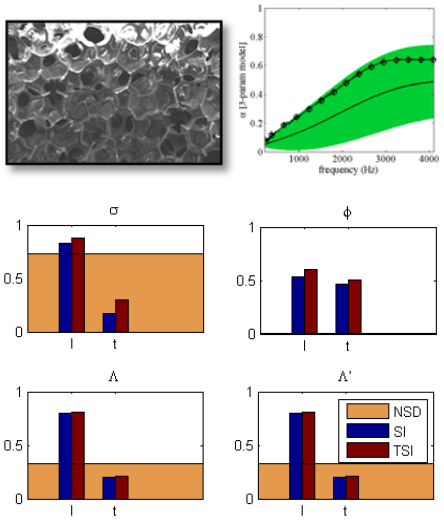

Figure 3: Sensitivity analysis of a micro-macro model of a PU foam
O. Doutres, M. Ouisse, N. Attala, M. Ichchou, JASA 2014