

## SEMINAR

ACOUSTIC METAMATERIALS BASED ON  
PHONONIC CRYSTALS**José Sanchez-Dehesa**

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It has been shown that arrays of acoustic scatterers in a fluid or a gas define, in the homogenization limit, a class of acoustic metamaterials or metafluids with extraordinary properties. These metafluids have positive dynamical mass density and positive bulk modulus, but they can be used to engineer materials with acoustical properties not known in nature. Along this talk I will review results recently obtained by our research group on this topic. First, I will introduce the homogenization theory allowing the determination of the acoustic parameters of metafluids based on phononic crystals made of periodic distributions of acoustic scatterers. It will be shown, for example, that acoustic structures can be tailored with a perfect matching of impedance with the surrounding medium. By using metafluids we have also fabricated and characterized gradient index acoustic lenses. Moreover, metafluids have been proposed to engineer structures with anisotropic dynamical mass density, a property required to build acoustic cloaks. In comparison with cloaking structures based on metamaterials with local resonances, these metafluids have broadband operation. Finally, I will show that anisotropic metamaterials can be used to introduce a new type of crystalline systems named Radial Wave Crystals, which are radially periodic structures that verify the Bloch theorem. These new crystals are possible for acoustic waves as well for electromagnetic waves.

## REMEMBER

**JOSÉ SANCHEZ-DEHESA**

**SPECIFIC SEMINAR:** Acoustic Metamaterials  
Based on Phononic Crystals.

**DATE:** June 4, 2010.

**TIME:** 12:00 pm.

**PLACE:** IFAE.