UNIVERSITÉ DE BORDEAUX

I2M BORDEAUX

Physical Acoustics Department

Call for a postdoctoral position

Single Nanoparticle as a GHz opto-acoustic transducer for local elastic probing at a submicron scale

(Open January 2012, Until Filled)

LOCATION : I2M – Physical Acoustics Department, UMR CNRS 5295, Université Bordeaux 1 - FRANCE

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KEYWORDS
Single nanoparticle, femtosecond pump-probe spectroscopy, Brillouin scattering, acoustic imaging

CONTEXT A growing interest is shown in characterizing elastic properties of the matter at smaller and smaller length scale for several purposes such as for instance: the quality control of the quality of solid-state devices (e.g. transistors) at a submicron scale, influence of the confinement of the matter on its elastic properties[1], elasticity mapping of a single biological cell… For the biological aspect, recent experiments in our group have highlighted the strong potential of GHz opto-acoustic waves to monitor the mechanical properties of a single cell[2].

A promising way to probe elasticity at a submicron scale is to exploit the high frequency acoustic field radiated by a single nanoparticle. In 2005, van Dijk *et al*. have reported the first observation of the ultrafast acoustic response of a single gold NP[3]. Recently, we have demonstrated a new detection mechanism of elastic vibrations of a submicron gold particle[4]. This mechanism, relying on an intrinsic common-path interferometer, offers the advantage of high sensitivity to Brillouin scattering close to the particle and therefore gives access to intrinsic elastic properties of the embedding medium[5]. To enhance the sensitivity of this technique, the opto-acoustic transduction efficiency of the nanoparticle has now to be optimized.

PROJECT The post-doctoral researcher will carry out pump-probe spectroscopy experiments on a single nanoparticle. At the same time, she/he will develop a theoretical model to describe acoustic eigenmodes of the nanoparticle (depending on its shape or its constitutive material) in order to infer its transduction efficiency. She/he will then experimentally investigate the acoustic response of the nanoparticle for different embedding media to demonstrate the strong sensitivity of this technique to elastic property of the environment.

QUALIFICATIONS AND EXPERIENCE The successful candidate should have a PhD in experimental physics and should be acquainted with one or more of the followings: Experimental physics involving optical techniques, ultrafast laser, acoustic imaging techniques or related fields. The candidate would be in charge of the development and use of the experimental set-up. Skills in data acquisition and experiment control are welcome.

SALARY 48 K€ (gross salary) from the French National Agency for Research (ANR).

Qualified persons interested to work in the above field and having relevant expertise are invited to send by email their application, including a cover letter, a CV, a list of publications and names and addresses of two referees who would write a letter of recommendation.

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[1] H Bodiguel and C. Fretigny, Phys. Rev. Lett. **97**, 266105 (2006).
[2] C. Rossignol et al., Appl. Phys. Lett. **93**, 123901 (2008).
[3] M. A. van Dijk *et al.*, Phys. Rev. Lett. **95**, 267406 (2005).
[4] Y. Guillet *et al*., Appl. Phys. Lett. **95**, 061909 (2009).
[5] Y. Guillet *et al*. (invited paper), Proc. SPIE **7937**, 79370G (2011).

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