



Laboratoire de Physique et d'Etude  
des Matériaux  
UMR 8213  
CNRS-ESPCI ParisTech-UPMC  
Paris Sciences et Lettres



## Internship (and PhD) Offer

### Study of a new memristive material

Memristors have been theoretically predicted by Leon Chua in 1971 [1] to be the fourth electrical component, relating electric charge and magnetic flux. They have been claimed to be experimentally realized by Strukov in 2008 [2]. They are particularly interesting for applications and it has been recently realized that RRAM (resistive random access memories) are memristors[3].

We have synthesized and studied a new family of lamellar titanium oxides that exhibit ferroelectric behaviour as well as memristive properties. The microscopic mechanism for the ferroelectricity is unclear and most probably unconventional. It most certainly involves non-trivial ionic motion inside the material.

The aim of the internship is to pursue this work in order to understand the microscopic mechanism at play, by performing electrical measurements (electrical constant, I-V curves and relaxation measurements), X-Ray diffraction, Raman spectroscopy, piezoresponse measurements and magnetization measurements. The internship period will be mainly devoted to electrical measurements. A substantial part of work will be devoted to modelling the observed effects.

The outcome of the project is twofold : elucidating the microscopic behaviour of the samples, and evaluating the possibility of making practical devices out of this material.

The applicant should possess a solid background in material physics. He (She) will get the possibility to learn a wide variety of techniques (including sample fabrication). He (she) should be highly motivated by experimental work and modelization and should be very well adapted to collaborations and interactions with other groups.

The experiments will be conducted mostly in the group of Dr. Leridon, ESPCI, Paris. Part of the experiments will be conducted in other universities in Paris.

[1] Leon O Chua. Memristor - the missing circuit element. *Circuit Theory, IEEE Transactions on*, 18(5), 507 (1971).

[2] Dmitri B Strukov, Gregory S Snider, Duncan R Stewart, and R Stanley Williams. The missing memristor found. *Nature*, 453(7191), 80 (2008)

[3] Leon Chua. Resistance switching memories are memristors. *Applied Physics A*, 102(4), 765, (2011)