Master 2: ***International Centre for Fundamental Physics***

INTERNSHIP PROPOSAL

(One page maximum)

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Thesis possibility after internship: YES
Funding: Concours ED - Cifre If YES, which type of funding:

Title

Study of Seebeck effect on metallic fractal nanostructures

Summary

One of the main challenges for renewable energies is the conversion into electrical energy of part of the heat unnecessarily lost in most industrial processes.
This is possible, for instance, by using thermoelectric processes like the Seebeck effect. If you heat a conductive structure at one end, the electrons acquire kinetic energy and migrate to the cold part, unlike positive ions which remain immobile.
This therefore leads to an imbalance of charges inducing the appearance of electric field and potential. A potential difference also appears at the junction of two conductors of different types exposed to a temperature difference. The best-known use of the Seebeck effect is to measure temperature with thermocouples. This effect also provides a process schema for the conversion of thermal energy into electrical one.
Recent studies on ionic liquids or charged colloidal solutions have shown very high conversion factors.
The main goal of this internship is the study of this effect on solutions and deposition of nanoparticles and nanostructures and in particular on fractal nanostructures obtained by vapor phase preformed clusters on carbon surfaces (graphite, graphene, nanotubes,…).
This involves experimental measurements using a high resolution potentiostat-galvanostat of thermoelectric charges, electrochemical characterization (zeta potential, cyclic voltammetry, etc.) and the interpretation of the data by numerical simulations.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Soft Matter and Biological Physics: YES
Quantum Physics: YES/NO Theoretical Physics: NO