COHERENT ELECTRON SOURCE ASSISTED BY A RESONANCE: CESAR

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KEYWORD(S) : field emission

SCIENTIFIC CONTEXT :

In the framework of the new research project COMODES, funded by the Agence Nationale de Recherche (ANR), we are searching a highly motivated candidate for a thesis in field emission of nanomaterials.

The coherence of light sources has evolved and improved through three main phases:

1) incoherent sources like the light bulb;

2) quasi-monochromatic sources such as gas-discharge lamps;

3) highly coherent LASERs.

In the field of vacuum electron sources, thermionic emission sources can be considered as an incoherent source and the best quasi-monochromatic sources are obtained by field emission. However, a vacuum electron source corresponding to the LASER is still missing, despite the major improvement it could offer for electron microscopy, lithography or high power radio-frequency communication. The goal of this project is to realize the equivalent of the LASER but for electron sources, we name such a source **CESAR** for Coherent Electron Source Assisted by a Resonance.

MISSIONS :

The basic ingredients to obtain a **LASER** are stimulated emission and a cavity to have gain and energy selectivity. For electrons, it is still possible to reach a coherent regime if the role of the cavity is played by a double barrier potential as shown in the figure below. **CESAR** sources will be made possible by the fabrication of a very low loss electron cavity. To this end, our project will focus on achieving better monolayer control near the interface between a conventional emitter and single molecules, self-assembled monolayers of thiols or transition metal dichalcogenide layers. This challenge, comparable to the realization of the **LASER** for light sources, will cover the research fields of nano-object field emission, monolayer synthesis and fabrication, and electronic transport modelling at the nanoscale

Profile: Master degree in Physics, Materials Science or related. Interest in nanoscience, materials characterization and nanoelectronics. Team working capability.

OUTLOOKS :

The intership can be followed by a PhD thesis (fully funded by ANR project).

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