

INAC: INSTITUT NANOSCIENCES ET CRYOGENIE

Research axes

INAC, a joint CEA-UJF research institute, is a major actor in fundamental research on condensed matter, soft matter and cryogenics in Grenoble. Most of its activities in physics, chemistry and at the interface with biology are included under the banner of nanoscience. It has programmes in several strategic areas: **low carbon energy, information technology, health technology, global defence and security, development and use of large facilities, cryogenics for space and for large facilities.** With the advent of nanosciences, the organisation of research within INAC based on decompartmentalizing scientific fields is more relevant than ever: synergies of all kinds are looked into in order to efficiently exploit all properties of matter, at the nanometer scale.

INAC has three major commitments:

- Producing frontier science results in basic research (~350 scientific publications in the best journals per year)
- Training of first class scientists through doctoral and post-doctoral studies (more than 100 PhD students at a time)
- Taking care of valorising opportunities of applications emerging from INAC breakthroughs (25 patents granted per year)

Actions within LANEF

Physics of Materials and Microstructures. Research in nanoscience and nanotechnologies, in the areas of nanomagnetism and spin electronics, nanophotonics and nanoelectronics. Nanostructure fabrication (notably semiconductors, in the framework of a NEEL-INAC joint group), atomistic simulation.



Fig. 1: Semiconductor nanowires

Spin in Electronics. Innovative concepts and applications in the field of spin electronics, up to demonstrators. Fundamental research in nanomagnetism, spin-dependent transport and innovative materials.

Statistical Physics, Magnetism and Superconductivity. improvement of fundamental knowledge in condensed matter. Strongly correlated electron systems and frustrated systems, low dimensional magnets, quantum transport in nanosystems.

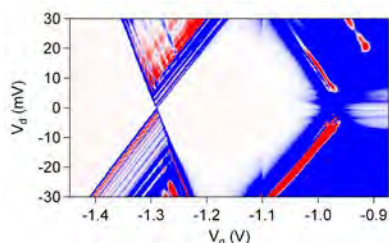


Fig. 2: experimental signature of transport through a single dopant in a silicon nanowire transistor (Copyright CEA/INAC)

Structure and Properties of Molecular Architectures. Interdisciplinary research in soft matter. Physics and chemistry of molecular and macromolecular systems at the interface with biology. Dynamics of biological interactions, chemistry and physics for organic and hybrid electronics and photovoltaics, ion conducting polymers.

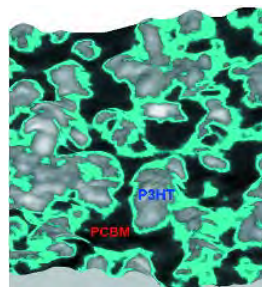


Fig. 3: Organic bulk heterojunction solar cell studied by Kelvin Probe AFM. Copyright CEA/INAC

Inorganic and Biological Chemistry. Chemistry for nanoscience, energy and the environment, health and related issues. Activities ranging from biochemistry to physical chemistry for a better understanding of fundamental mechanisms and to promote applications development.

Cryogenic engineering. Cryogenics and cryotechnologies for major national and international fundamental research projects in various fields: space, inertial fusion, magnetic fusion (collaboration Cryo GIS with Air Liquide and NEEL). Projects are taken from the ground research phase up to final implementation. Basic research on turbulence and thermohydraulics.

Key figures:

300 permanent positions (80%CEA, 10%CNRS, 10% University)

More than 200 non-permanent positions, including 160 PhD students and postdocs

350 scientific publications, with an average impact factor >4.

6 ERC grant laureates doing their research project at INAC (one advanced grant and 5 starting grants)