

# RESEARCH

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# ACTIVITY

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**DIPC IS DEDICATED  
TO TWO MAIN AREAS  
OF RESEARCH**

## **CONDENSED MATTER PHYSICS**

The current activity—mainly theory and computational physics—is focussed on three different lines: Interactions of ions with matter; Electronic response of surfaces, solids and nanostructures; Interaction of fast electrons and radiation with nanostructured materials. Moreover, a Nano-Physics Laboratory project is being developed in collaboration with a Technological Center of the Basque Country (Labein). Within these general areas, different recent topics can be identified:

### **Interaction of ions with matter**

*Phase effect in the stopping of ions in metals  
Stopping of slow ions in insulators*

### **Electronic response of surfaces, solids and nanostructures**

*Dynamics of electrons and holes in solids and at their surfaces  
Electronic properties in finite and extended systems  
Electronic structure and magnetic properties of nanowires*

### **Interaction of fast electrons and radiation with nanostructured materials**

*Interaction of radiation and fast electrons with complex nanostructures (Smith-Purcell and microscopy based light emission induced by fast electrons)  
Plasmon excitations in nanostructures  
Photoemission from core and valence levels*

## **POLYMERS AND NON-CRYSTALLINE MATERIALS**

The current activities in this area are focussed on the general line: Molecular motions and relaxation processes in polymer materials and glass-forming systems. This is mainly an experimental approach by combining different techniques, in particular, neutron scattering, broadband dielectric spectroscopy and NMR. Moreover, we are also developing fully atomistic molecular dynamics simulations of polymer systems. Within this general area, we can identify the following recent topics of research:

### **Molecular motions and relaxation processes in polymer materials and glass-forming systems**

*Dynamics of multicomponent polymer systems*

*Atomistic MD-Simulations in simple polymers*

*Dynamics of glass-forming polymers at "intermediate range order" length scales*

*The problem of the Glass Transition*

*Relationship between transport properties and molecular mobility in polymeric membranes*

*Biomolecules vs synthetic polymers.  
Universal dynamic properties?*