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of Joule heating and extract temperature profiles from the interior of CNTs acting as interconnects.
In general, electrical probing studies of CNTs had been performed in the absence of information concerning its internal structure, with relatively low spatial resolution and often not resolved in time. Consequently, what happened in the tubular channel during the Joule heating process remained a mystery. Working with a transmission electron microscope and an electrical probing sample holder, Costa *et al*. were able to locate the hottest points inside an electrically-heated nanotube due to the solid-to-vapour phase transitions that took place in a carbon-encapsulated semiconductor nanowire. In addition, the team also followed the migration of these hot-spots and their evolution. The sublimation fronts of the confined nanowire acted as temperature markers to understand how heat is distributed along and across the tube.
Besides CNTs, the method reported may be used to evaluate the resistive heating behaviour of other nanoscaled tubular interconnects. Eventually, it may also be envisaged as a test-bed for the study of phase transitions occurring in confined spaces such as nanometer-sized channels of porous materials.

inversion of the noisy Radon transform on SO(3) by Gabor frames and sparse recovery principles

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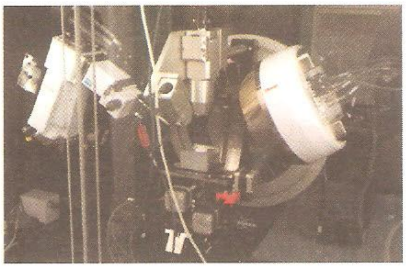

One of the modern methods in determining the structure of polycristalline materials is the so-called X-ray diffraction tomography. For each incidence ray one measures the diffraction pattern and from this information one desires to determine the crystallographic structure of the material. Mathematically this is done by inverting the so-called spherical Radon transform which is an ill-posed inverse problem. In the paper "Inversion of the noisy Radon transform on SO(3) by Gabor frames and sparse recovery principles", Appl. Comput. Harmon. Anal. (2011) a new method for obtaining a stable approximation of the inverse of the spherical Radon transform was established. X-ray tomography of crystallographic structures using diffraction experiments is a computationally expensive task. To give an idea of the complexity of the problem just by measuring as few as 100 incidence rays and 100 scattered rays one obtains already 10 000 measurements. The developed numerical method reduces the problem greatly by constructing new building blocks (so-called spherical Gabor frames) which allow us to use sparse recovery principles (only a few building blocks have non-zero coefficients) while maintaining a stable approximation of the inverse of the spherical Radon transform. The proposed approach is composed by basic building blocks of the coorbit theory on homogeneous spaces, Gabor frame constructions and variational principles for sparse recovery. The performance of the finally obtained iterative approximation is studied through several experiments and it was shown that this new method works well with noisy data.

Nd isotope composition of marine sediments as a tracer for iceberg provenance in the last glaciation

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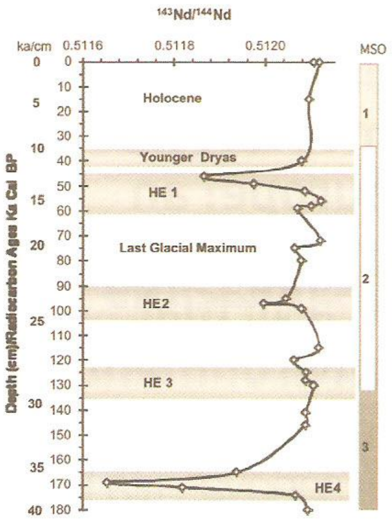
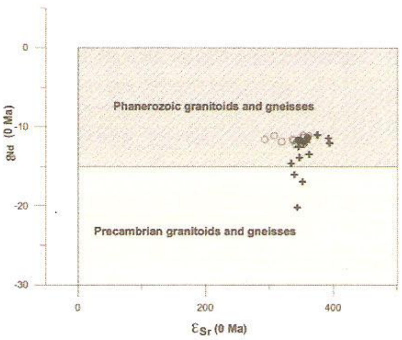
OMEX core KC 024-19 was studied aiming at to assess the influence of climate changes on the origin and transport of the sediments of the Galician continental slope, in the last 40 thousand years. The sampled sediments are composed mostly of silt and clay, but also include a coarser-grained (sand-sized) fraction, corresponding essentially to foraminifera tests. Another remarkable feature is the occurrence of four depth intervals characterized by abundances greater than usual of relative large terrigenous clasts (considered as ice-rafted debris – IRD), related to melting of massive influxes of icebergs into the North Atlantic during the so-called Heinrich Events (HE).
In order to obtain information on the origin of the detrital component of the sediments, 27 selected samples were submitted to a leaching procedure, to eliminate the biogenic fraction, and then analysed for Nd and Sr

isotopes by TIMS, in the Isotope Geology Laboratory of the University of Aveiro. The obtained 143Nd/144Nd and 87Sr/86Sr ratios vary from 0.512072 to 0.511604 and from 0.732273 to 0.725140, respectively. Significantly, the lowest Nd isotope ratios were obtained in samples from HE layers, namely in HE1 (~ 15 ka BP), HE2 (~ 24 ka BP) and HE4 (~ 38 ka BP). These results suggest a strong contribution of continental crustal sources significantly older than the Variscan basement for events HE 1, 2 and 4. The most likely provenance of the coarse clasts deposited during these three events lie probably in NE America, where Precambrian basement occupies large areas, and the carrier icebergs should be fragments of the Laurentide Ice Sheet. This provenance is probably related to extremely cool conditions.
In contrast, the HE3 (~ 28 ka BP) layer displays Nd isotope ratios in the range of the compositions of the most common sediments in the core and, therefore, its IRD should have European source(s).





piezoelectric PLLA as a platform for tissue growth

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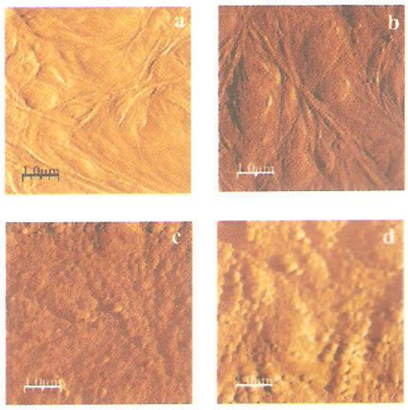
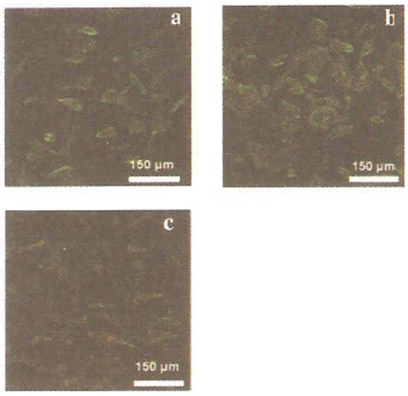
Imagine an implantable platform made of an intelligent material capable of thwarting bone resorption by simple electrical stimulation. PLLA, a FDA approved biomaterial, is one of the few candidates than can fulfil the challenge. Physical exercise is known to increase bone mass but the exact processes responsible for the bone growth were not untangled yet. The piezoelectric character of organic component in bone has been pointed as a possible "transducer" (converter of mechanical energy into electrical and vice versa) in bone tissue synthesis but the exact mechanisms are still unknown. The use of some piezoelectric materials to correct bone defects has demonstrated to promote a faster bone growth comparing to non piezoelectric materials.
Poly (L-lactic) acid (PLLA), a semi-crystalline polymer, is currently being investigated for bone regeneration purposes since it possesses a valuable combination of properties. Beyond the biocompatibility, biodegradability and adjustable physical properties, PLLA is piezoelectric. In vivo, piezo effect is expected to create charges in the surrounding area of bone and enhance regeneration processes. This research intends to shade light on how the polarization of a piezoelectric substrate influences bone growth processes.





PLLA as spin coated films, solvent casted films, nanofibers and scaffolds have been prepared. PLLA was poled by different processes: by corona poling for macroscopic polarization or locally poled at the nanoscale level by applying a DC field through a piezoresponse force microscopy (PFM) tip. The molecular orientation induced by the electrical field was checked by imaging by PFM.
The electrically induced polarization of PLLA was investigated regarding its stability over time and its effect on human proteins and osteoblast-like cells. *In vitro*, we have shown for the first time that polarization and surface charges in PLLA have an effect on biological events occurring during bone regeneration. Polarization significantly enhances fibronectin adsorption as well as osteoblast-like cells adhesion, spreading and proliferation. We also demonstrated that in semi crystalline PLLA the polarization decay starts only after 10 days; time enough to trigger and maintain the adhesion of proteins and proliferation of cells.