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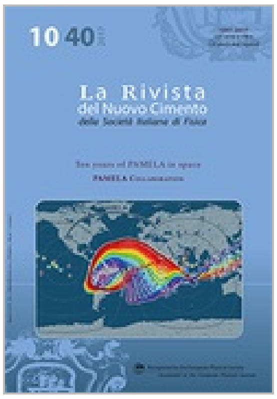
La Rivista del Nuovo Cimento, Vol. 40, N. 10 (2017)
Ten years of PAMELA in space
PAMELA Collaboration



Launched in 2006 from the Baikonur cosmodrome in Kazakhstan, the PAMELA cosmic-ray detector has completed ten years of nearly continuous data-taking. In a decade of operation the satellite-borne experiment has provided plenty of scientific data, covering different issues related to cosmic-ray physics. Its discoveries might change our basic vision of the mechanisms of production, acceleration and propagation of cosmic rays in the Galaxy. Along the decennium, the PAMELA instrument has been making high-precision measurements of the charged component of the cosmic radiation over four decades of energy, with unprecedented statistics opening a new era of precision studies in cosmic rays. Among the most relevant analyses, the antimatter measurements, focus of the experiment, have set strong constraints to the mysterious nature of Dark Matter.

Il Nuovo Cimento, Vol. 40, N. 3 (2017)
SciNeGHE 2016
Edited by *M. Razzano, G. Spandre, B. Patricelli*

This issue is dedicated to the 11th edition of the workshop *Science with the New Generation of High Energy Gamma-ray Experiments* (SciNeGHE), held in Pisa on October 18-21, 2016. The workshop focused on the study of high-energy gamma-ray sources from a multi-wavelength and multi-messenger perspective, particularly in connection with gravitational waves, both from the observational and theoretical point of view.

EPJ E – Highlights
Drag of a Cottrell atmosphere by an edge dislocation in a smectic-A liquid crystal
P. Oswald, L. Lejček

By deliberately interrupting the order of materials - by introducing different atoms in metal or nanoparticles in liquid crystals - we can induce new qualities. For example, metallic alloys like duralumin, which is composed of 95% of aluminium and 5% copper, are usually harder than the pure metals. This is due to an elastic interaction between the defects of the crystal, called dislocations, and the solute atoms, which form what are referred to as Cottrell clouds around them. In such clouds, the concentration of solute atoms is higher than the mean concentration in the material. In a paper published in EPJ E, Patrick Oswald from the École Normale Supérieure of Lyon, France, and Lubor Lejček from the Czech

Academy of Sciences have now theoretically calculated the static and dynamical properties of the Cottrell clouds, which form around edge dislocations in lamellar liquid crystals of the smectic A variety decorated with nanoparticles. This work could be important, for example, in the context of improving the lubricating performance of such liquid crystals.
Read more

EPJ E – Highlights

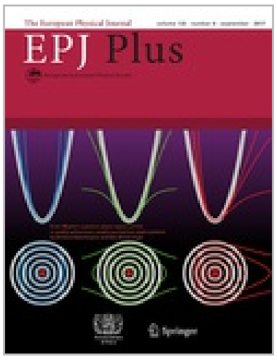
Entropic segregation of short polymers to the surface of a polydisperse melt

P. Mahmoudi, M.W. Matsen

Better than playing with Legos, throwing polymer chains of different lengths into a mix can yield surprising results. In a new study published in EPJ E, physicists focus on how a mixture of chemically identical chains into a melt produces unique effects on their surface. That's because of the way short and long polymer chains interact with each other. In these kinds of melts, polymer chain ends have, over time, a preference for the surface. Now, Pendar Mahmoudi and Mark Matsen from the University of Waterloo, Ontario, Canada, have studied the effects of enriching long-chain polymer melts with short-chain polymers. They performed numerical simulations to explain the decreased tension on the surface of the melt, due to short chains segregating at the surface over time as disorder grows in the melt. They found an elegant formula to calculate the surface tension of such melts, connected to the relative weight of their components.
Read more

EPJ Plus – Highlights

Polarimetry of small bodies and satellites of our Solar System



S. Bagnulo, I. Belskaya, A. Cellino, L. Kolokolova

The solar system is full of various small bodies such as planetary moons, main belt asteroids, Jupiter Trojans, Centaurs, trans-Neptunian objects and comets. To study them, scientists typically analyse the radiation they reflect, which is referred to as polarimetry. Scientists not only focus on the intensity of the scattered radiation, but also on how photons oscillate in the plane perpendicular to their direction of propagation - that is, their polarisation. Combining these two aspects yields significantly better descriptions than data obtained from the intensity alone. In a paper published in EPJ Plus, Stefano Bagnulo from Armagh Observatory and Planetarium in Northern Ireland, UK, and colleagues review the state-of-the-art in polarimetry for studying the small bodies in our solar system.
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