

# Editoria - dicembre 2018

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## Il Nuovo Saggiatore

Il nuovo numero de *Il Nuovo Saggiatore*, Vol. 34, n. 5-6 (2018) è ora disponibile **online**.

**Eccezionalmente l'accesso ai contenuti di questo numero sarà aperto a tutti e non solo ai soci in regola fino al termine del 2018.**

In questo numero troverete interessanti articoli su

- Experiments on gravity: from Galileo Galilei to quantum sensors with ultracold atoms
- The impossible spin and its applications
- Measuring cosmic ray showers near the North Pole with the Extreme Energy Events project (articolo in libera consultazione nello spazio **online** "free to read" de *Il Nuovo Saggiatore*)
- Marcello Conversi: a remembrance
- The discovery of helium
- The 1927 Solvay Meeting: Einstein's third "Witches' Sabbath" in Brussels

Nella rubrica *Il Nostro Mondo* troverete il resoconto della Cerimonia inaugurale del 104° Congresso SIF ad Arcavacata di Rende e le relazioni dei vincitori del Premio Fermi 2018 e del Premio Occhialini 2018 della SIF. Infine un resoconto sul Premio Nobel per la Fisica 2018.

**Se non lo avete ancora fatto, vi invitiamo ad associarvi o a rinnovare la vostra associazione alla SIF per ricevere la copia cartacea del Nuovo Saggiatore. Il Nuovo Saggiatore è fruibile online e su APP per tutti i soci in regola.**

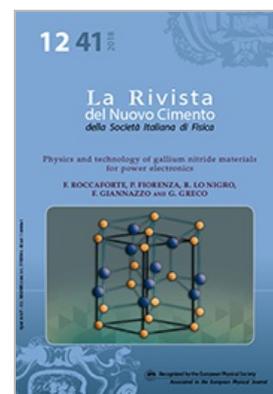


## La Rivista del Nuovo Cimento Vol. 41 N. 12 (2018)

### Physics and technology of gallium nitride materials for power electronics

*F. Roccaforte, P. Fiorenza, R. Lo Nigro, F. Giannazzo, G. Greco*

A significant reduction of the global energy consumption can be achieved by the introduction of a next generation of energy efficient power devices based on new semiconductor technologies. Gallium nitride and related alloys have always been of interest for their applications to the light emitting diodes, and the invention of the blue LED was awarded with the Nobel Prize in Physics in 2014. Beyond that, the GaN outstanding physical and electronic properties make it a promising semiconductor also for high-power electronic devices, where it can enable to overcome the Si limits. However, there are still several hurdles, which hinder the full exploitation of this material. This article aims at giving an overview on selected scientific problems related to the technology, with a special attention to the



case of high electron mobility transistors. After an introduction on the fundamental physical properties of the material, a special emphasis is given to the problem of current transport at metal-GaN interfaces, considering both Ohmic and Schottky contacts. Subsequently, the importance of the dielectrics either as passivation or gate insulation layers is briefly highlighted. Then, the possible approaches to control the two-dimensional electron gas in AlGaN-GaN heterostructures and to fabricate normally-OFF high electron mobility transistors are presented. Finally, a short description of the status of vertical GaN devices technology is given.

## **Il Nuovo Cimento Vol. 41 N. 3 (2018)**

### **SIF Congress 2017**

This issue of *Il Nuovo Cimento* is dedicated to a selection of the best communications at the *103rd National Congress of the Italian Physical Society*, held in Trento on 11-15 September 2017, by a number of young, talented members of the Society. The National Congress is a good occasion to prize these young physicists of different fields with a rapid publication of their results and *Il Nuovo Cimento* is particularly suitable to comprehensively highlight them.

### **EPJ A – Highlights**

#### **The P2 experiment**

*D. Becker et al.*

The P2-experiment at the new electron accelerator MESA in Mainz aims at a high-precision determination of the weak mixing angle at the permille level at low  $Q^2$ . This accuracy is comparable to existing measurements at the Z-pole but allows for sensitive tests of the Standard Model up to a mass scale of 50 TeV. The weak mixing angle will be extracted from a measurement of the parity violating asymmetry in elastic electron-proton scattering. The asymmetry measured at P2 is smaller than any asymmetry measured so far in electron scattering, with an unprecedented accuracy. This review just published in EPJ A describes the underlying physics and the innovative experimental techniques, such as the Cherenkov detector, beam control, polarimetry, and the construction of a novel liquid hydrogen high-power target. The physics program of the MESA facility comprises indirect, high-precision search for physics beyond the Standard Model, measurement of the neutron distribution in nuclei, transverse single-spin asymmetries, and a possible future extension to the measurement of hadronic parity violation.

Read more

### **EPJ E – Highlights**

#### **New Insights from Shale Gas Production at the Microscopic Scale**

*N. Kovalchuk, C. Hadjistassou*

Extracting gas from new sources is vital in order to supplement dwindling conventional supplies. Shale reservoirs host gas trapped in the pores of mudstone, which consists of a mixture of silt mineral particles ranging from 4 to 60 microns in size, and clay elements smaller than 4 microns. Surprisingly, the oil and gas industry still lacks a firm understanding of how the pore space and geological factors affect gas storage and its ability to flow in the shale. In a study published in EPJ E, Natalia Kovalchuk and Constantinos Hadjistassou from the University of Nicosia, Cyprus, review the current state of knowledge regarding flow processes occurring at scales ranging from the nano- to



the microscopic during shale gas extraction. This knowledge can help to improve gas recovery and lower shale gas production costs.

[Read more](#)

### **EPJ Plus – Highlights**

#### **Deviation analysis for texture segmentation of breast lesions in mammographic images**

*B. Mughal, N. Muhammad, M. Sharif*

Breast cancer is a disease predominantly affecting females and in the last decades the incidence rate rose. Nowadays, main risk factors, apart from genetic predisposition, include obesity, physical inactivity, hormone replacement therapy during menopause, and alcohol consumption. During the 1980s and 1990s, mammography screening has taken hold detecting many new cases. This technique takes advantage of low energy X-rays to examine breast tissues and early detect masses or microcalcifications, which are cancer's 'alarm bells'. Major issues in mammography concern the development of methods allowing a fast and clear interpretation of the collected screening images. A group of scientists reports on EPJ Plus a new technique to improve the screening images reconstruction in order to achieve high accuracy. The proposed method can be used to remove pectoral muscle from the images which generates noisy features on the detected tumor mass, as well as to segment the breast lesion region providing a larger view of a small section of the image.

[Read more](#)

