14th European Conference on Organized films ECOF-14

June 29- July 2 2015

Genova, Italy, EU

P16 - Spin Convertion And Spin-Phonon Interaction in Thin Films of Cryovacuum Condensates of Methane

Andrey Drobyshev - al-Farabi Kazakh national university, Almaty

Other Authors: Abdurakhman Aldiyarov (Kazakh national university) , Tolegen Kozhamkulov(Kazakh national university), Zhanatay Nurekeyev (Kazakh national university), Ainura Shinbayeva(Kazakh national university), Aliya Tychengulova (Kazakh national university)

Solid methane belongs to a group of crystals which contains molecules of hydrogen, whose macroscopic properties (thermal expansion, etc.) are greatly caused by spin interaction of nucleus of hydrogen. In particular, the methane molecule, which has four protons with spin I = 1/2, has three total spin modifications: para-, ortho- and meta- states with three values of the total spin moments of 0, 1 and 2, accordingly. As a result of conversion between these states, an equilibrium concentration ratios set corresponding to the temperature of the system. Identification of connection between the speed of conversion and conditions of formation and existence of solid methane is an object of the research the last 40 years [1, 2]. In this report the results of optical researches of thin films of methane cryovacuum condensates, which were formed at a temperature of a substrate of T=16 K and subjected further to thermostimulated influences, are offered to discussion. The obtained features, such as nonmonotonic variation of the absorption amplitude at the frequency ν=1290 cm^{-1} during the methane films heating, allow to make the assumption that during temperature increase the sample undergoes the transformations caused by spin conversion.

[1] Yuki Miyamoto, Mizuho Fushitani, Daisuke Ando, and Takamasa Momose. J. of Chem. Phys. 114502 (2008)
[2] A. J. Nijman, A John Berlinsky. Phys. Rev. Let., 38, 408 (1977)

P17 - Free-standing and flexible 1D photonic crystals obtained by periodically arranged thin polymeric films

Marti Duocastella - Istituto Italiano di Tecnologia, Genova

Other Authors: Simonluca Piazza, Salvatore Surdo, Alberto Diaspro (Istituto Italiano di Tecnologia, Genova)

One-dimensional (1D) photonic crystals (PhCs) are periodic multilayer structures capable of reflecting particular wavelengths of light while transmitting all the others according to the so-called photonic bandgap: a range of 'forbidden' wavelengths. Such an effect is caused by the periodic variation in the crystal refractive index –constructive interference between light reflected at each layer occurs for wavelengths close to the spatial period of the structure, resulting in a high-quality bandpass mirror. Commercially available 1D-PhCs are mainly fabricated with inorganic materials and by expensive vacuum deposition techniques. Even if great control over the resulting film thickness and uniformity can be reached, 1D-PhCs obtained through these methods are not optimal when features such as resistance to failure and fracture are required, e.g. in order to obtain self-standing, flexible structures. To this purpose, wet coating techniques combined with organic materials, such as polymers, offer a promising alternative. In this work, we used spin-coating to produce 1D-PhCs consisting of periodically arranged thin films (about 100 nm-thick) of two common polymers, namely: Poly(vinyl alcohol) (PVA) and Poly(methyl methacrylate) (PMMA). In order to increase the refractive index contrast between the two polymers, we employed zinc oxide (ZnO) nanoparticles as a doping agent for the PVA layers. As a result, we were able to fabricate