# ПУБЛИКАЦИИ ОСНОВНЫХ РЕЗУЛЬТАТОВ НАУЧНОЙ ДЕЯТЕЛЬНОСТИ СОТРУДНИКОВ ПОЛИТЕХНИЧЕСКОГО ИНСТИТУТА (ФИЛИАЛ В Г. МИРНОМ) В РЕЙТИНГОВЫХ ЖУРНАЛАХ, ИНДЕКСИРУЕМЫХ В БАЗАХ ДАННЫХ WEB OF SCIENCE / SCOPUS ЗА ПЕРИОД С 2017 ПО 2020 гг.

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1. Kozhanov, A.I., Lukina, G.A. Spatially nonlocal problems with integral conditions for third-order differential equations // Differential Equations. – 2017. Vol. 53. – Iss. 7. DOI: 10.1134/S0012266117070047. База данных: Scopus. Квартиль: Q1.

Аннотация

We obtain sufficient conditions for the existence of regular solutions of some nonlocal problems for the equation uttt + uxx + μu = f(x, t) with conditions containing integrals with respect to the spatial variable. © 2017, Pleiades Publishing, Ltd.

2. Abdullina, D.U., Semenova, M.N., Semenov, A.S., Korznikova, E.A., Dmitriev, S.V. Stability of delocalized nonlinear vibrational modes in graphene lattice // European Physical Journal B. – 2019. Vol. 11. – Iss: 92. DOI: 10.1140/epjb/e2019-100436-y. База данных: Scopus. Квартиль: Q2.

Аннотация

Crystal lattices support delocalized nonlinear vibrational modes (DNVMs), which are determined solely by the lattice point symmetry, and are exact solutions of the equations of atomic motion for any interatomic potential. DNVMs are interesting for a number of reasons. In particular, DNVM instability can result in the formation of localized vibrational modes concentrating a significant part of the lattice energy. In some cases, localized vibrational modes can be obtained by imposing localizing functions upon DNVM. In this regard, stability of DNVMs is an important issue. In this paper, molecular dynamics is employed to address stability of all four delocalized modes in a graphene lattice in the presence of small perturbations both in the plane and normal to the plane of the lattice. When DNVM amplitude is above the stability threshold, atom trajectories deviate from the mode pattern exponentially in time. Critical exponents are calculated for the in- and out-of-plane displacements. Stability threshold amplitudes are established. Interestingly, in three of the studied DNVMs the in-plane displacements diverge faster, but in one of them the instability develops through the out-of-plane displacements. This result can be explained by the difference in atomic vibration patterns of DNVMs. Reported results refine our understanding of the nonlinear dynamics of graphene lattice and can be useful in the design of electro-mechanical resonators and sensors.

3. Krylova, K.A., Lobzenko, I.P., Semenov, A.S., Kudreyko, A.A., Dmitriev, S.V. Spherically localized discrete breathers in bcc metals V and Nb // Computational Materials Science. – 2019. Vol. 180. – Iss. DOI: 10.1016/j.commatsci.2020.109695. База данных: Scopus. Квартиль: Q1-Q2.

Аннотация

Discrete breathers (DBs), also called intrinsic localized modes (ILMs), are spatially localized, large-amplitude vibrational modes in nonlinear lattices. Rod-like discrete breathers (DBs) have been reported in fcc Ni and bcc Nb by Haas et al. in 2011 based on molecular dynamics simulations. Here we use a general approach to find new type DBs in bcc V and Nb. In this approach, we firstly find the lattice symmetry dictated exact solutions to the equations of atomic motion in the form of delocalized nonlinear vibrational modes (DNVMs). Secondly, a localizing function with spherical symmetry is imposed over the DNVMs. Parameter of the localizing function is chosen such that the obtained DB has a long lifetime. The results presented in this work demonstrate that pure metals can support a variety of DBs. Interatomic potentials have a strong effect on the DB lifetime. Maximal DB lifetime in V is two orders of magnitude larger than that in Nb. The results of this study are interesting for the theory of DBs, and also they will help to better understand the impact of DBs on the physical properties of metals.

4. Krylova, K.A., Korznikova, E.A., Semenov, A.S., Bachurin, D.V., Dmitriev, S.V. Linking tracks in mica crystals with phase transitions in a bistable lattice // European Physical Journal B. – 2020. Vol. 93. – Iss: 2. DOI: 10.1140/epjb/e2020-100565-0. База данных: Scopus. Квартиль: Q2.

Аннотация:

Since the middle of the last century, scientific research has been conducted to explain the nature of the tracks visible to the naked eye in mica muscovite crystals. In the present work, an attempt to link the appearance of tracks with a phase transition in a bistable medium is made using classical molecular dynamics method. For this purpose, a two-dimensional triangular lattice simulating one row of potassium atoms in mica is considered. Interactions between atoms are described via pairwise Morse potential and a local potential, whose minima create a hexagonal lattice. In order to create a bistability in the system, a mismatch between the equilibrium distance of the triangular lattice and the period of the local potential is artificially introduced. The phase transitions arising from a monotonic increase or decrease of the depth of the local potential are described. It is revealed that at lower temperatures the domains of different phases can coexist, but at higher temperatures the domain with lower potential energy grows with heat release by reducing the high energy domain. It is speculated that the considered model, which provides the possibility of coexistence of two different phases, can be used to explain at qualitative level the nature of dark tracks visible with the naked eye in transparent crystals of mica muscovite.

5. Shepelev, I.A., Korznikova, E.A., Bachurin, D.V., Semenov, A.S., Chetverikov, A.P., Dmitriev, S.V. Supersonic crowdion clusters in 2D Morse lattice // Physics Letters, Section A: General, Atomic and Solid State Physics. – 2020. Vol. 384. – Iss: 1. DOI: 10.1016/j.physleta.2019.126032. База данных: Scopus. Квартиль: Q2.

Аннотация

For the first time, the class of simple N-crowdions is expanded to M×N-crowdions, dynamics of which is investigated in two-dimensional triangular Morse lattice by means of molecular dynamics simulations. The M×N-crowdions are excited by giving initial velocity V0 to the chosen M×N block of atoms along a close-packed direction. In the notations here N is the number of neighboring atoms in one close-packed row and M is the number of neighboring rows. The 2×1, 2×2 and 2×4-crowdions are chosen for consideration. It is found that the 2×1 and 2×2-crowdions demonstrate stable dynamics, while the 2×2-crowdions propagate longer distances and need less energy for their excitation in comparison with the 2×1 and classical 1×1-crowdions. Unlike the first two, the 2×4-crowdions are unstable and transform very quickly into the 2×2-crowdions by losing interstitials, which are quasi-mobile and inclined by 60° with respect to the direction of the initial velocity vector. Maximal distances travelled by the crowdions as functions of initial velocity are calculated. The 2×2 and 2×4-crowdions are found to be the most effective in mass transfer. The defect structure arising in the crystal as a result of initiation of M×N-crowdions and its dependence on the initial velocity is discussed.