Prof. Leonid I. Manevitch

Head of Theoretical Division
Department of Polymers and Composite Materials,
Semenov Institute of Chemical Physics,
Russia Academy of Sciences

Professor of Moscow Institute of Physics and Technology
(Technical University).

CURRICULUM VITAE

Date of birth:	The 2nd April 1938.
Address:	141021, Mytishchi, Moscow region, Letnaya street, 30/1, 70.
Phone:	007-495-582-4914; 007-495-939-7515; 007-495-939-7139
Fax:	007-495-137-82-84
E-mail:	manevitchleonid3@gmail.com, lmanev@center.chph.ras.ru

RESEARCH INTERESTS

- Asymptotic methods in Mechanics and Solid State Physics.
- Nonlinear Normal Modes and Soliton-like excitations in Solids.
- Energy exchange, localization and transfer in nonlinear systems.
- Microscopic mechanisms and macroscopic description of Plastic deformation, Relaxation, Fracture of Polymers.
- Micromechanics of Composites.
- Phase transitions in Polymers and Polymer Blends.

RESEARCH AND TEACHING EXPERIENCE

10/76 – present Head of Theoretical Laboratory, Department of Polymers and Composites, Institute of Chemical Physics, Russia Academy of Sciences.

9/83 - 2012 Professor of Moscow Institute of Physics and Technology.

11/64 - 10/76 Professor of Dniepropetrovsk State University.

9/59 - 11/64 Research engineer and Head of Theoretical Group in Aerospace Institute, Dniepropetrovsk, Ukraine.

9/65 - present Supervising professor (35 Ph.D.). Author of 15 monographs and more than 300 papers, Soros professor (1995-1996, 1997, 1998, 2001).

EDUCATION

12/70 Dr. Sci. Title of thesis: "Asymptotic and group theoretic methods in mechanics of anisotropic and nonhomogenious solids." Dniepropetrovsk State University.

10/61 Ph.D. in Mechanics of Solids. Title of thesis: "Stability of nonuniformly loaded elastic shells." Dniepropetrovsk State University.

6/59 M.S. in Applied Mechanics. Dniepropetrovsk State University.

BOOKS AND BOOKS CHAPTERS (reverse chronological order)

1. L.I. Manevitch. On conclusiveness in Physics. In: Proof. Moscow Studies in the Philosophy of Mathematics. P. 335-348. Ed. V.A. Bazhanov, A.N. Krichevets, V.A. Shaposhnikov. URSS, M. 2013. (in Russia)
2. L.I. Manevitch, O.V. Gendelman. Tractable Models of Solid Mechanics. Formulation, Analysis and Interpretation. Heidelberg Dordrecht London New York, Springer, 2011, 302p.
3. L.I. Manevitch, V.V. Smirnov. Resonant energy exchange in nonlinear oscillatory chains and Limiting Phase Trajectories: from small to large system. In "Advanced Nonlinear Strategies for Vibration Mitigation and System Identification" CISM Courses and Lectures, v.518. Ed.: Alexander F. Vakakis, Springer, New York, 2010, p. 207-258
4. L.I. Manevitch, V.V. Smirnov. Solitons in Macromolecular Systems. Nova Science Publishers, New York, 2008, p.134
5. A.I. Manevitch, L.I. Manevitch. The Mechanics of Nonlinear Systems with Internal Resonances. Imperial College Press, London, 2005, 250p.

6. I.V. Andrianov, R.G. Barantsev, L.I Manevitch. Asymptotical Mathematics and Synergetics. Moscow, Editorial URSS, 2004, 302 p. (in Russian).
7. I. Andrianov, J. Awrejcewicz, L.I Manevitch. Asymptotical Mechanics of Thin-Walled Structures. Berlin-Heidelberg –New York, Springer, 2004, 535p.
8. Igor V. Andrianov, Leonid I. Manevitch. Asymptotology. Ideas, Methods, and Applications. Dordrecht/Boston/London. Kluwer Academic Publishers, 2002, 252p.
9. L.I Manevitch, I.V. Andrianov, V.G. Oshmyan. Mechanics of Periodically Heterogeneous Structures, Berlin-Heidelberg-New York, Springer-Verlag, 2002, 264p.
10. J. Awrejcewicz, I. Andrianov, L. Manevitch. Asymptotic approaches in nonlinear dynamics: new trends and applications. Berlin-Heidelberg –New York, Springer-Verlag., 1998, 350p.
11. A.F. Vakakis, L.I. Manevitch, Yu.V. Mikhlin, V.N. Pilipchuk, A.A. Zevin. Normal modes and localization in nonlinear systems. New York: Wiley, 1996, 552p.
12. I.V. Andrianov, L.I. Manevitch. Asymptotology: ideas, methods, results. Moscow, Aslan (in Russian), 1994, 154p.
13. L.I. Manevitch, A.V. Pavlenko. Asymptotic methods in micromechanics of composites. Kiev: Vysshaya Shkola, (in Russian) 1991, 125p.
14. L.I. Manevitch, Yu.V. Mikhlin, V.N. Pilipchuk. Method of normal vibrations for essentially nonlinear systems. Moscow: Nauka, (in Russian) 1989, 216p.
15. I.V. Andrianov, L.I. Manevitch. Asymptotic methods and physical theories. Moscow: Znanie, (in Russian) 1989, 65p.
16. I.V. Andrianov, V.A. Lesnichaya, V.V. Loboda, L.I. Manevitch. Asymptotic methods in statics of orthotropic shells. Kiev: Vysshaya Shkola, (in Russian) 1986, 150p.
17. I.V. Andrianov, V.A. Lesnichaya, L.I. Manevitch. Averaging methods in statics and dynamics of stiffened shells. Moscow: Nauka, (in Russian) 1985, 222p.
18. L.I. Manevitch, A.V. Pavlenko, S.G. Koblik. Asymptotic methods in the theory of orthotropic solids. Kiev: Vysshaya Shkola, (in Russian) 1982, 152p.
19. V.I. Mossakovsky, L.I. Manevitch, A.M. Miltzin. Modeling of strength of thin shells. Kiev: Naukova Dumka, (in Russian) 1977, 160p.

List of selected papers (reverse chronological order)

1. M. Kovaleva, V. Pilipchuk, L. Manevitch. Nonconventional synchronization and energy localization in weakly coupled autogenerators. *Physical Review E* **94** (3), 032223
2. Z. Zhang, I. Koroleva, L.I. Manevitch, L.A. Bergman, A.F. Vakakis. Nonreciprocal acoustics and dynamics in the in-plane oscillations of a geometrically nonlinear lattice. *Physical Review E* **94** (3), 032214
3. A.N. Ivanova, S.I. Kuchanov, S.A. Shaginyan, L.I. Manevitch. The soliton mechanism of phase separation of polydisperse multiblock copolymers. *Polymer Science Series A* **58** (1), 111-119
4. V.V. Smirnov, L.I. Manevitch, M. Strozzi, F. Pellicano. Nonlinear optical vibrations of single-walled carbon nanotubes. 1. Energy exchange and localization of low-frequency oscillations. *Physica D* **325**, 113–125, 2016. http://www.sciencedirect.com/science/article/pii/S0167278915300786

5. L.I. Manevitch, A. Kovaleva, G. Sigalov. Nonstationary energy localization vs conventional stationary localization in weakly coupled nonlinear oscillators. *Regular and Chaotic Dynamics.* **21** (2), 147-159, March 2016.
6. L.I. Manevitch, I.P. Koroleva (Kikot). Limiting Phase Trajectories as an alternative to Nonlinear Normal Modes. *Procedia IUTAM, IUTAM Symposium Analytical Methods in Nonlinear Dynamics* **19**, 144-151, 2016
7. F. Romeo, L.I. Manevitch, L.A. Bergman, A. Vakakis. Transient and chaotic low-energy transfers in a system with bistable nonlinearity. *Chaos* **25** (5), 053109, 2015
8. L.I. Manevitch, F. Romeo. Non-stationary resonance dynamics of weakly coupled pendula. *EPL*, **112** (3), 30005(1-6), 2015
9. L.I. Manevitch. A Concept of Limiting Phase Trajectories and Description of Highly Non-stationary Resonance Processes. *Applied Mathematical Sciences*, **9** (86), 4269 – 4289, 2015.
10. K.G. Silina, I.P. Kikot, L.I. Manevitch. Energy exchange and localization in the planar motion of weightless beam carrying two discrete masses. Regular and Chaotic Dynamics. **20** (2), 109-122, 2015.
11. V.V. Smirnov, O.V. Gendelman, L.I. Manevitch. Front propagation in a bistable system: How the energy is released. *Phys. Rev. E* **89**, 050901(R), 2014. DOI: http://dx.doi.org/10.1103/PhysRevE.89.050901
12. V.V. Smirnov, D. S. Shepelev, L.I. Manevitch. Localization of Low-Frequency Oscillations in Single-Walled Carbon Nanotubes. *Phys. Rev. Letters* **113**, 135502 (1-11), 2014
13. L.I. Manevitch, G. Sigalov, F. Romeo, L.A. Bergman, A. Vakakis. Dynamical of a Linear Oscillator Coupled to a Bistable Light Attachment: Analitical study. *J. Appl. Mech.* (J APPL MECH-T ASME) **81** (4), 041011 (2014) doi:10.1115/1.4025150
14. M. Strozzi,, L.I. Manevitch, F. Pellicano,V.V. Smirnov, D.S. Shepelev. Low-frequency linear vibrations of single-walled carbon nanotubes: Analytical and numerical models. Journal of Sound and Vibration, **333** (13), 2936–2957, 2014.
15. L.I. Manevitch, M.A. Kovaleva, V. N. Pilipchuk. Non-conventional synchronization of weakly coupled active oscillators. EPL, **101**(5), (2013) 50002. doi: 10.1209/0295-5075/101/50002
16. A. Kovaleva, L.I. Manevitch. Emergence and stability of autoresonance in nonlinear oscillators. Cybernetics and physics, 2 (1), 25–30, 2013
17. L. I. Manevitch, M. A. Kovaleva, and V. N. Pilipchuk, Non-conventional Synchronization of Weakly Coupled Active Oscillators, *Europhys.Lett.* **101**, 50002 (2013)
18. Y. Starosvetsky, L.I. Manevitch. On intense energy exchange and localization in periodic FPU dimer chains. *Physica D: Nonlinear Phenomena*, **264**, 66-79, 2013
19. A. Kovaleva, L.I. Manevitch. Resonance energy transport and exchange in oscillator arrays. *Phys. Rev. E.*, **88**(2), 024904, 2013
20. A. Kovaleva, L.I. Manevitch. Limiting phase trajectories and emergence of autoresonance in nonlinear oscillators. *Phys. Rev. E.*, **88**(2), 024901, 2013
21. A. Kovaleva, L.I. Manevitch, Nonlinear energy transfer in classical and quantum systems, Phys. Rev. E., 87, 022904 (1-12), 2013
22. M.A. Hasan, Y. Starosvetsky, A.F. Vakakis, L.I. Manevitch. Nonlinear targeted energy transfer and macroscopic analogue of the quantum landau-zener effect in coupled granular chains. *Physica D: Nonlinear Phenomena*, 2013, **252** (1), 46-58, 2013.

23. V.V. Smirnov, D.S. Shepelev, L.I. Manevitch. Energy exchange and transition to localization in the asymmetric Fermi-Pasta-Ulam oscillatory chain. The European Physical Journal B, 86 (1), 10 (1-9), 2013. DOI: 10.1140/epjb/e2012-30753-2
24. M.A. Kovaleva, L.I. Manevich, V.N. Pilipchuk. Statistical, Nonlinear, and Soft Matter Physics. New type of synchronization of oscillators with hard excitation. *JETP*, **117**(2), 369-377, 2013
25. Y. Starosvetsky, M.A. Hasan, A.F. Vakakis, L.I. Manevitch. Strongly Nonlinear Beat Phenomena and Energy Exchanges in Weakly Coupled Granular Chains on Elastic Foundations. *SIAM Journal of Applied Mathematics* **72**(1), 337-361, 2012
26. Yuli Starosvetsky, K. R. Jayaprakash, Alexander F. Vakakis, Gaëtan Kerschen, and Leonid I. Manevitch. Effective particles and classification of the dynamics of homogeneous granular chains with no precompression. *Phys. Rev. E*., **85** (3), 036606, 2012
27. G. Sigalov, O.V. Gendelman, M.A. AL-Shudeifat, L.I. Manevitch, A.F. Vakakis et al. Alternation of regular and chaotic dynamics in a simple two-degree-of-freedom system with nonlinear inertial coupling. Chaos **22**, 013118 (2-10), 2012; doi: 10.1063/1.3683480
28. O.V. Gendelman, G. Sigalov, L.I. Manevitch, M. Mane, A.F. Vakakis, L.A. Bergman. Dynamics of an Eccentric Rotational Nonlinear Energy Sink. Journal of Applied Mechanics. 2012, 79, 011012(1-9)
29. G. Sigalov, O.V. Gendelman, M.A.AL-Shudeifat, L.I. Manevitch, A.F. Vakakis and L.A. Bergman. Resonance Captures and Targeted Energy Transfers in an Inertially-Coupled Rotational Nonlinear Energy Sink. Nonlinear Dynamics
30. A. Kovaleva, L. I. Manevitch. Classical analog of quasilinear Landau-Zener tunneling. Physical Review E, 85, 016202 (1-8), 2012.
31. O.V. Gendelman, G. Sigalov, L.I. Manevitch, M. Mane, F. Vakakis, L.A. Bergman. Dynamics of an Eccentric Rotational Nonlinear Energy Sink. Journal of Applied Mechanics, 79, 011012 (1-9), 2012
32. А.Н. Иванова, Л.И. Маневич. Журнал вычислительной математики и математической физики, 51 (4), 1-12, 2011
33. A.S. Kovaleva, L.I. Manevitch, Yu.A. Kosevich. Fresnel integrals and irreversible energy transfer in an oscillatory system with time-dependent parameters. *Physical Review E* **83**, 026602, 2011
34. L. Manevitch, A. Kovaleva, D. Shepelev. Non-smooth approximations of the limiting phase trajectories for the Duffing oscillator near 1:1 resonance. *Physica D: Nonlinear Phenomena*, **240** (1), 1-12, 2011
35. L. Manevitch, A. Kovaleva, E. Manevitch, D. Shepelev. Limiting phase trajectories and non-stationary resonance oscillations of the Duffing oscillator. Part 2. A dissipative oscillator. *Communications in Nonlinear Science and Numerical Simulation* **16** (2), 1098–1105, 2011
36. Kovaleva A., Manevitch L., Manevitch E. Intense energy transfer and superharmonic resonance in a system of two coupled oscillators. *Physical Review E* **81** (5), 056215 (1-12), 2010
37. L.I. Manevitch, V.V. Smirnov. Resonant energy exchange in nonlinear oscillatory chains and Limiting Phase Trajectories: from small to large system. In “Advanced Nonlinear Strategies for Vibration Mitigation and System Identification” CISM Courses and Lectures, v.518. Ed.: Alexander F. Vakakis, Springer, New York, 2010, p. 207-258.
38. L.I. Manevitch, V.V. Smirnov. Nonlinear dynamical models of p[olymer and nano-dimensional systems. In: Introduction in Micro- and Nano-Mechanics: Mathematical models and methods. P. 203-251. Ed. Potapov A.I., N. Novgorod, 2010 (In Russian).

39. Kosevich Y.A., Manevitch L.I., Manevitch E.L. Vibrational analogue of nonadiabatic Landau–Zener tunneling and a possibility for the creation of a new type of energy traps. *Physics-Uspekhi* **53,** 1281-1286, (2010)
40. L.I. Manevich, V.V. Smirnov. Limiting Phase Trajectories and Thermodynamics of Molecular Chains. *Physics-Doklady*, **55 (**7) p. 324-328, 2010
41. Y.A. Kosevich, L.I. Manevitch, A.V. Savin. Energy transfer in weakly coupled nonlinear oscillator chains: Transition from a wandering breather to nonlinear self-trapping. Journal of Sound and Vibration 322, 524–531, 2009.
42. L.I. Manevitch, V.V. Smirnov. Localized nonlinear excitations and interchain energy exchange in the case of weak coupling in "Modeling, Simulation and Control of Nonlinear Engineering Dynamical Systems: State-of-the-Art, Perspectives and Applications" Awrejcewicz, Jan (Ed.), Springer, 2009, p.37-47.
43. L.I. Manevitch. Vibro-impact models for smooth non-linear systems. In: Lecture Notes in Applied and Computational Mechanics, vol. 44 (Vibro-impact dynamics of ocean systems and related problems), p. 191-201, Springer, 2009.
44. R.A. Turusov, L.I. Manevitch. Introduction to Adhesion Mechanics. Polymer Science, D, Glues and Sealing Materials, 2 (4), 209-213, 2009.
45. R.A. Turusov, L.I. Manevitch. The method of contact layer in the Adhesion Mechanics. Pol. Sci, D 4(6) 2009
46. R.A. Turusov, L.I. Manevitch. The method of contact layer in the Adhesion Mechanics. Pol.Sci, D 4(8) 2009
47. L.I. Manevitch, A.V. Savin, C.-H. Lamarque. Low-frequence breathers in a polyethylene crystal. One-dimension problems. Physica D, Nonlinear Phenomena, 237 (5), 600-612, 2008
48. L.I. Manevitch, O.V. Gendelman. Oscillatory models of vibro-impact type for essentially non-linear systems. Proc. IMechE, Vol. 222 Part C: J. Mechanical Engineering Science, 2007-2043, 2008
49. Yu.A. Kosevich, L.I. Manevitch, A.V. Savin. Wandering breathers and self-trapping in weakly coupled nonlinear chains: Classical counterpart of macroscopic tunneling quantum dynamics. Phys.Rev. E 77, 046603(1-20), 2008
50. O.V. Gendelman, L.I. Manevitch. Discrete breathers in vibroimpact chains: Analytic solutions Phys.Rev. E, 78, 026609 (1-6), 2008
51. M.A. Mazo, L. I. Manevich, E.B. Gusarova, M.Yu. Shamaev, A.A. Berlin, N.K. Balabaev, G.C. Rutledge. Computer Simulation of Thermo-Mechanical Properties of Layered Nano-Crystals for the Example of Montmorillonite Crystal. Russian Journal of Mathematical Physics, 15, (3), 419-421, 2008.
52. M.A. Mazo, L.I. Manevitch, N.K. Balabaev, A.A. Berlin, E.B. Gusarova, M.Yu. Shamaev, G. Rutledge. Temperature Dependence of Elastic Properties of a Pyrophyllite Plate by Molecular Dynamics Simulation". J. Phys. Chem. B, 112, 2964-2969, 2008
53. M.A. Mazo, L.I. Manevitch, E.B. Gusarova, A.A. Berlin, N.K. Balabaev, G. Rutledge. Molecular Dynamics Simulation of Thermo-Mechanical Properties of Montmorillonit Crystal. II. Hydrated Montmorillonite Crystal. J. Phys. Chem C, 112, 17056–17062, 2008.
54. M.A. Mazo, L.I. Manevitch, E.B. Gusarova, M.Yu. Shamaev, A.A. Berlin, N.K. Balabaev, G. Rutledge. Molecular Dynamics Simulation of Thermo-Mechanical Properties of Montmorillonite Crystal. III. Montmorillonite Crystals with PEO Oligomer Intercalates. J. Phys. Chem. B, 112, 3597-3604, 2008.

55. Manevich L.I. In: Alwyn Scott “Nonlinear science: emergence and dynamics of coherent structures”, Moscow, PHYSMATLIT, 2007, p. 532-545.
56. L.I. Manevitch, A.I. Musienko, C.-H. Lamarque. New analytical approach to energy pumping problem in strongly nonhomogeneous 2DOF systems. Meccanica, v.42 (1), 77-83, 2007.
57. E.A. Zubova, N.K. Balabaev, L.I. Manevitch. Molecular mechanisms of the chain diffusion between crystalline and amorphous fractions in polyethylene. Polymer, 48 (6), 1802-1813, 2007.
58. L.I. Manevitch. New approach to beating phenomenon in coupled nonlinear oscillatory chains. Arch.Appl.Mech. 77(5), 301-312, 2007.
59. Маневич Л.И., Смирнов В.В. Нелинейные локализованные колебания плоского зигзага. ДАН, 413 (3), 1-6, 2007 (L. I. Manevich, V. V. Smirnov. Localized Nonlinear Oscillations of a Planar Zigzag. Doklady Physical Chemistry, 413, Part 1, pp. 69–73, 2007).
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61. A.I. Musienko, C.-H. Lamarque, L. I. Manevitch. Design of mechanical energy pumping devices. Journal of Vibration and Control, 12 (4), 355-371, 2006.
62. N.A. Kovaleva, A.V. Savin, L.I. Manevich, A.V. Kabanov, V.M. Komarov, L.V. Yakushevich. Topological Solitons in an Inhomogeneous DNA Molecule. Polymer Science, Ser. A, 48 (3), 278, 2006.
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70. O. V. Gendelman, D.V. Gorlov, L. I. Manevitch, A. I. Musienko. Dynamics of coupled linear and essentially nonlinear oscillators with substantially different masses. Journal of Sound and Vibration, 286, 1-19, 2005.
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73. L.I. Manevitch, A.V. Savin. Peirls barrier. In: Encyclopedia of Nonlinear Science, New York and London, Routledge, 2005, 693-695.
74. L.I Manevitch, A.I. Musienko. Short wavelength dynamics of the system of nonlinear oscillators coupled by stretched weightless beam. Chaos Solitons & Fractals, v.26 (1), 107-116, 2005.

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76. L.I. Manevitch, O.V. Gendelman, A.V. Savin. Nonlinear normal modes and chaotic motions in oscillatory chains. “Chaotic Dynamics and Control of Systems and Processes in Mechanics”, Proceedings of the IUTAM Symposium held in Rome, Italy 8-13 June 2003, Springer, eds. G. Rega and F. Vestroni, 59-68, 2005.
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78. L.I. Manevich. New approach to beating phenomenon in coupled nonlinear oscillators chains. 8th Conference on Dynamical Systems-Theory and Applications, Proceedings. Lodz, December 12-15, 2005, Poland, V.1, pp. 119-136.
79. N.A. Kovaleva, L.I. Manevich. Localized nonlinear oscillation of DNA molecule. 8th Conference on Dynamical Systems-Theory and Applications, Proceedings. Lodz, December 12-15, 2005, Poland, V.1, pp. 103-110.
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81. O.V. Gendelman, L.I. Manevitch, A.F.Vakakis, L.Bergman. A Degenerate Bifurcation Structure in the Dynamics of Coupled Oscillators with Essential Stiffness Nonlinearities. Nonlinear Dynamics, 33 (3), 1-10, 2003.
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84. A.I. Manevitch, L.I. Manevitch. Free oscillations in conservative and dissipate symmetric cubic two-degree-of freedom systems with closed natural frequencies. Meccanica, 38, (3), 335-348, 2003
85. A.V. Savin, L.I. Manevitch, Discrete breathers in a polyethylene chain, Phys. Rev. B., 67, p.144302 (1-5), 2003
86. O.V.Gendelman, L.I. Manevitch, O.L. Manevitch. Solitonic mechanism of structural transition in polymer-clay nanocomposites. J. of Chemical Physics, 119, (2), 704326JCP (1-4), 2003
87. L.I. Manevitch, A.I. Musienko, A.F. Vakakis, L. Bergman. Dynamic interaction of a semi-infinite linear chain of coupled oscillators with a strongly nonlinear end attachment. Physica D: Nonlinear Phenomena, 178, (1-2), 1-18, 2003
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89. L.I. Yakushevich, A.V. Savin, L.I. Manevitch, Nonlinerar dynamics of topological solitons in DMA, Phys. Rev. E., 66, 016614, 2002
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92. A.N. Ivanova, L.I.Manevitch, Two-dimensional model of phase separation during polymerization of a binary polymer blend. In: Heterophase network polymers. Synthesis, Characterization and properties. Chapter 7, p.79-91, Taylor&Francis, London and New York, 2002
93. L.I. Manevitch, B.A. Rozenberg, S.A. Shaginyan, Analytical Description of Microphase formation in curing polymer blends. In: Heterophase network polymers. Synthesis, Characterization and properties, p.63-78, Taylor&Francis, London and New York, 2002
94. O.V. Gendelman, L.I. Manevitch, A.F. Vakakis, R. M'Closkey. Energy "pumping" in nonlinear mechanical oscillators. I: Dynamics of the underlying Hamiltonian systems. J. Appl.Mechs, 68 (1), 34-41, 2001.
95. L.I. Yakushevich, A.V. Savin, L.I. Manevitch, Nonlinerar dynamics of topological solitons in DMA, Phys. Rev. E., 66, 016614, 2001
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