Nonlinear Dynamics and Systems Theory, **15** (1) (2015) 4–13

Coupled Fractal Nanosystem: Trap – Quasi-two-dimensional Structure

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Received: March 31, 2014; Revised: December 17, 2014

Abstract: For a model nanosystem various types of quasi-two-dimensional fractal structures are obtained. To this end the theory of fractional calculus and the concept of fractal are used. Various types of fractal nanotraps based on quasi-two-dimensional fractal structures are obtained by the method of sections. It is shown that the behavior of the deformation field for the coupled state of the fractal nanosystem is essentially different from the behavior of the deformation field for the uncoupled state. It is proposed to use fractal nanotraps for trapping individual particles or groups of particles in order to study their physical properties.

Keywords: *quasi-two-dimensional fractal structures; fractional calculus; nanosystem; nanotraps; numerical modeling.*

Mathematics Subject Classification (2010): 93A10, 93A30.

1 Introduction

Investigating the fundamental properties of nanosystems and nanomaterials of a new generation [9–11, 14] is actual for the modern areas of nanotechnology, structural and nonlinear mechanics [8]. The active nanostructural elements in real nanomaterials are clusters, pores, quantum dots, wells, two-dimensional quantum billiards (quantum corrals) [17]. These elements can find their application in quantum information science, nanomechanics, quantum optics, and for the quantum computers, molecular spin memory devices [14]. The theoretical description of the chaotic states in the structural mechanics, analysis of nonlinear dynamical models of attractors and the chaotic simulation are discussed in the books [8, 16–18].

Quasi-two-dimensional fractal structures such as fractal linear, elliptic and hyperbolic dislocations, fractal quantum dots (particles or groups of particles) [3–6] may occur in

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