Deformed space time of the piezonuclear emissions

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Abstract

An experimental verification of the relationship between the deformed Minkowsky space-time and the piezonuclear emission has been obtained by testing several cylindrical steel bars cyclically loaded in a mechanical fatigue machine. During the compression cycles, α-particles have been both detected by a Ag-ZnS scintillator and a Geiger counter. Taking into account the theory of the Deformed Special Relativity, we report that the emission only occurs after a specific value of energy is overcome. This value is strictly related to the weak and strong nuclear interactions, which in turn define the regions of Minkowsky and non-Minkowsky space-time.

1. Introduction

A new kind of nuclear reactions, characterised by neutron and alpha emissions without concomitant gamma emission, were reported to occur after mechanical pressure, fracturing or cavitation. They are named piezonuclear reactions since they are determined by pressure, either of acoustic or mechanical nature [1-14]. This phenomenon could be the signature of a new aspect of physics also involving the nuclear interactions, as it was theoretically and experimentally discussed [1,8,11]. In the last decade, experiments have been carried out in water solutions of iron salts, rocks and metals treated with ultrasonic waves and, in the case of metals and rocks, also with mechanical loading cycles in order to verify the possible emission of ionising particles [2-10]. The feasibility of the emissions has been forecast [1,11] and their experimental detection has been tested. The occurrence of some fundamental structural and physical characteristics was suggested to be needed. They concern the energy density accumulated in the material, the number of cavities and their dimensions [13].

In the following, we shall discuss about the size of the cavities, assumed of spherical shape, and the energy barrier to overcome. The first condition has been experimentally investigated in $\alpha -$ iron samples treated with ultrasonic waves and analysed by FESEM techniques [7,13] . Concerning the existence of an energy barrier, or energy threshold, we will take into account the Deformed Special Relativity theory (DSR), that forecasts a strictly relationship between the breakdown of the Local Lorentz Invariance (LLI) and the deformation of the Minkowski space, which is itself connected to the onset of piezonuclear interactions.

Referring to the DSR we will show that the breakdown of the LLI implies a new physical dimension, which can be considered as a variable in the metric describing the Minkowski space. Such a new variable - or rather dimension - is the energy connected to the fundamental physical interactions (electromagnetic, gravitational, weak and strong) and plays a major role in the piezonuclear phenomena.

According to the DSR [8,11], some peculiar thresholds occur in the energy scale, each one corresponding to a specific interaction: the lowest value (4.5 μeV) corresponds to the