Physics Letters A 373 (2009) 862–866

Contents lists available at ScienceDirect

Physics Letters A

www.elsevier.com/locate/pla

Piezonuclear neutrons

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ARTICLE INFO

Article history:
Received 6 December 2008
Accepted 29 December 2008
Available online 7 January 2009
Communicated by F. Porcelli

ABSTRACT

We report the results of neutron measurements carried out during the application of ultrasounds to a solution containing only stable elements like Iron and Chlorine, without any other radioactive source of any kind. These measurements, carried out by CR39 detectors and a Boron Triflouride electronic detector, evidenced the emission of neutron pulses. These pulses stand well above the electronic noise and the background of the laboratory where the measurements were carried out.

1. Introduction

The application of ultrasounds of suitable frequency and amplitude to a liquid, with gas dispersed in it, brings about the process that is known as cavitation [1,2]. It occurs when the micro bubbles dispersed in the liquid collapse under the spherically symmetric compressions of ultrasounds. The processes that go on during the collapse and the collapse itself are quite complex and there is a good deal of research going on in order to clarify their physical and chemical aspects. Some of the studies that have been carried on, have the target to exploit cavitation as the mean to induce deuterium–deuterium nuclear fusion in a liquid matrix [3–12]. It is known as well that mechanical waves like ultrasounds and shockwaves can induce or better catalyse nuclear reactions in radioactive elements, fission in fissile elements with emission of ionising and neutron radiation too low for the occurring transmutations or with no emission at all [13–17]. The research that we have carried on, although it might seem to deal with the same physical terms such as nuclear reactions, nuclear radiation and to point towards the same technological direction, it is based on different theoretical concepts, that are all presented in [18–20], and in this sense is moving along a parallel path with respect to the other research paths and together with them it contributes to enlarge our view and knowledge of these new physical phenomena. We carried out five experiments in the last few years. In the first three of them [21–23] we collected evidences of anomalous production of intermediate and high mass number nuclides within samples of cavitated water. These outcomes, that agree with those obtained by Russian teams [13–17], point out that ultrasounds can induce nuclear phenomena such as modifications of the nuclei, and alter secular equilibriums. A further outcome of these three experiments is that the number of protons after cavitation is conserved while the number of neutrons is not. This circumstance convinced us to carry out some experiments in order to confirm this evidence by revealing the presence of emitted neutrons during cavitation. Two sets of experiments [20] were carried out in which we cavitated water and different solutions of metallic salts, of different concentrations with diverse ultrasonic power and different geometry of the sonotrode tip and the cavitation chamber. All of these experiments succeeded in detecting neutrons. We would like to stress that all our experimental equipment and our measurements, when devoted to prove neutron emission, never involved any radioactive source or unstable nuclide unlike other experiments [3–12].

2. Initial evidence of neutron emission

Our first main goal was only to reveal (not exactly measure) any possible emission of neutrons from the solutions subjected to cavitation. Thus we used the CR-39 (PADC) plastic track detector that is a $C_{12}H_{18}O_7$ polymer with density 1.3 g/cm^3 which is used for registration of heavy charged particles and is a very convenient mean of detection. Charged particles are registered directly, and neutrons are detected through a secondary recoil particles or nuclear reactions. The CR39 energy range sensitivity is very wide, from tens of keV to hundreds of MeV. Particle tracks on the detector become visible after chemical etching and are investigated using a microscope. As we stated above, the only evidence that we could gain from the previous experiments was the nonconservation of the number of neutrons which suggests a possible neutron emission, but does not say anything about their spectrum, their

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0375-9601/$ – see front matter
doi:10.1016/j.physleta.2008.12.060