Journal of Nuclear and Radiation Physics, Vol. 1, No. 1, 2006, pp. 77-78

Letter to the Editor

IS IT TRUE THAT ^{210}Po IS FISSIONED BY ANTI-NEUTRINOS?

Sayed A. El-Mongy

National Center for Nuclear Safety and Radiation Control, AEA, Cairo, Egypt.
Email: sayedelmongy@hotmail.com

Rec. 29/10/2005 Accept. 4/4/2006

When I was working with measurements of β-delayed neutrons which are produced from some of fission products (e.g. ^{87}Br), 10^5 neutrons were observed and counted. The irradiated uranium concentrations were too small to give this huge number of neutrons from ^{235}U fission. An ISFP process suggested that ^{210}Po might be fissioned by anti-neutrinos that were produced in the reactor core.

Neutrino has no charge and almost of zero rest mass, <30 eV. The particle was postulated in 1930 to solve both the problems of energy conservation and spin, and detected in 1953 through inverse β-processes. The interaction cross-section of neutrinos with matter is very small (~ 10^{-48} b). Operating reactors generate huge numbers of antineutrinos, ~10^{26}/d from typical power reactor.

Very small concentrations (ppb) of uranium were irradiated for 2 minutes in the thermal channel of the 100kW TRIGA reactor, Germany – Mainz, at a flux of 1.7 x 10^{12} n/cm^2. sec. In the case of Pulse mode, this reactor has a flux of 10^{25} n/cm^2.sec. The delayed neutrons were then counted for 1 minute by a well calibrated ^{3}He neutron counter.

The number of delayed neutrons due to irradiation of the samples was found to be 10^5 neutrons. The samples were also containing the even-even ^{210}Po. For the same reactor and in the same irradiation conditions, 10^5 neutrons were obtained from about 8 μg/g of ^{235}U [1]. The following two simultaneous stages mechanism (abbreviated as ISFP) is suggested to be the process taken place in the samples inside the reactor core environment:

$$\tilde{\nu} + {}^{210}Po \xrightarrow{fission} {}^{197}Pt + {}^{13}C$$

$$\alpha\left(from\ {}^{210}Po\right) + {}^{13}C \rightarrow {}^{16}O + n$$

So, the presence of the observed neutrons might be due to simultaneously both delayed neutrons from ^{235}U fission and fission of ^{210}Po by anti-neutrinos ($\tilde{\nu}$, f) through the nuclear reaction; $^{13}C(\alpha,n)^{16}O$.

ACKNOWLEDGEMENT

This work was carried out through the DAAD scholarship (Germany) for my Ph.D. thesis. Prof. Dr. K.L. Kratz - Institute for Nuclear Chemistry-Mainz, was my Ph.D supervisor. The work was not a part of the thesis, it is suggested and the explanation is proposed by myself.

REFERENCE

[1] Hube, G., Lenz, S., and Kratz, K.L., "Determination of the Uranium and Thorium Contents in Aqueous Samples with Neutron Activation Analysis", 3rd International Conference on Nuclear and Radiochemistry, Vienna, 7-11 Sept., 1992.

هل صحيح أن البولونيوم – ٢١٠ ينشطر بواسطة ضديد النيترينو؟

سيد أ. المونجي

المركز القومي للأمان النووي والرقابة الإشعاعية، هيئة الطاقة الذرية، مصر.

تم في هذا الخطاب إقتراح تفاعل نووي لنواة البولونيوم -٢١٠ مع ضديد النيوترينو لتفسير تواجد فيض من النيوترونات المتأخرة في قلب المفاعل النووي بكثافة أعلي من تلك الناتجة عن انشطار نواة اليورانيوم – ٢٣٥.