



ISPITIVANJE RADIOAKTIVNOSTI PIJAĆIH VODA EXAMINATION OF RADIOACTIVITY IN DRINKABLE WATERS

IZVOD

Jezgra nekih atoma imaju sposobnost da emituju jednu ili više čestica. Tada dolazi do „raspada“ jezgra. Ova pojava se naziva radioaktivnost. Pri α raspadu radioaktivna jezgra emituju jezgra helijumovih atoma (${}^4_2\text{He}$), dok se pri β raspadu iz jezgra emituju elektron i čestica antineutrino.

Radioaktivni niz urana ($U - 238$) predstavlja se sledećom reakcijom: $U^{238} \rightarrow Th^{234} + \alpha \rightarrow Pa^{234} + \beta \rightarrow \dots \rightarrow Pb^{206}$

Za Srbiju je uran interesantan zato što se njegova najveća nalazišta nalaze na Staroj planini i planini Bukulji. Četvorovalentni uran je bezopasan po životnu sredinu jer je nerastvoran i nije mobilan. Šestovalentni uran je rastvoran u obliku UO_2^{2+} jona koji gradi komplekse koji se lako transportuju hidrotermalnim izvorima. UO_2^{2+} jon gradi karbonatne komplekse u oksidacionoj, blago kiseljoj i baznoj sredini koji su veoma rastvorni. Šestovalentni uran je stoga opasan za životnu sredinu jer je mobilan, gradi lako rastvorne komplekse i kao posledica toga lako prelazi iz litosfere u hidrosferu.

Cilj eksperimenta bio je određivanje radioaktivnosti pijaće vode iz sela Orašca, kod Aranđelovca, podno planine Bukulje. Određivana je ukupna α i β aktivnost.

Analizom pijaće vode dobijene su vrednosti koje su ispod maksimalno dozvoljenih koncentracija propisanih Pravilnikom, odakle sledi da je voda radiološki ispravna.

Ključne reči: radioaktivnost, uran, eksperiment, α i β aktivnost

ABSTRACT

Nuclei of some chemical elements have ability to emit one or more particles. It leads to nuclear disintegration. This phenomenon is known as radioactivity. During a decomposition, radioactive nucleus emits nucleus ${}^4_2\text{He}$, while at β decomposition, nucleus emits electron and antineutrino.

Uranium has radioactive series which presents following reaction: $U^{238} \rightarrow Th^{234} + \alpha \rightarrow Pa^{234} + \beta \rightarrow \dots \rightarrow Pb^{206}$.

Serbia has significant depositions of uranium at mountain Bukulja and Stara planina, which makes uranium of great interest for Serbia. U^{4+} is not harmful for the environment, because it is insoluble and has low mobility. U^{6+} is soluble as UO_2^{2+} ion because it builds complex compounds which are very mobile in hydrothermal waters. UO_2^{2+} ion builds carbon-complex compounds if it is present in slightly acid or alkaline environment. These complex compounds are very soluble. Therefore, U^{6+} is very dangerous for environment, because of its mobility and soluble complex compounds. U^6 that, as a consequence, can easily circulate from lytosphere to hydrosphere.

Purpose of the experiment was to determine radioactivity in drinking water from village of Orasac, near the city of Arandjelovac, beneath the mountain Bukulja. Total α and β activity determination was made.

The drinkable water analysis has given values that are bellow the approved maximum concentration level, as prescribed by The Rule Book, indicating that the given water sample is radioactively correct.

Key words: radioactivity, uranium, experiment, α and β activity

1 α i β RASPAD

Jezgra nekih atoma imaju sposobnost da emituju jednu ili više čestica. Tada dolazi do „raspada“ jezgra. Ova pojava se naziva radioaktivnost. Jezgra koja emituju čestice se nazivaju radioaktivna jezgra, za razliku od stabilnih jezgara koja nemaju ovu sposobnost. Raspadom jezgra, koje se još naziva i jezgro roditelj, nastaje novo jezgro (jezgro potomak), koje može imati drugi redni i atomski broj u odnosu na jezgro roditelj. Radioaktivni raspad određen je vrstom emitovanih

1 α and β DISINTEGRATION

Nuclei of some chemical elements have ability to emit one or more particles. It leads to nuclear disintegration. This phenomenon is known as radioactivity. Nuclei that emit particles are called radioactive nuclei, in contrast to stable nuclei that do not have this capability. The disintegration of the nucleus, which is also called the parent nucleus, gives a new nucleus (the descendant nucleus), which may have other ordinal and atomic number compared to the parent nucle-