Paper Number: 483

Speciation of Metals by Ionizing Radiation in Groundwater Samples from Taiaçupeba reservoir, Metropolitan Region of São Paulo, Brazil

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Ionizing radiation is also used as a fast technique low cost advanced oxidation for decomposition of complex organic substances in distinct matrices. The analytical traditional processes, made with the addition of nitric acid to acidify, digest and store the samples, and subsequently effecting quantitative analysis by ICP-OES, does not guarantee to obtain results without organic matter interference. It is known that analytical systems, such as ICP-OES, reaches high temperatures and despite this condition, the complex organic material is not completely mineralized.

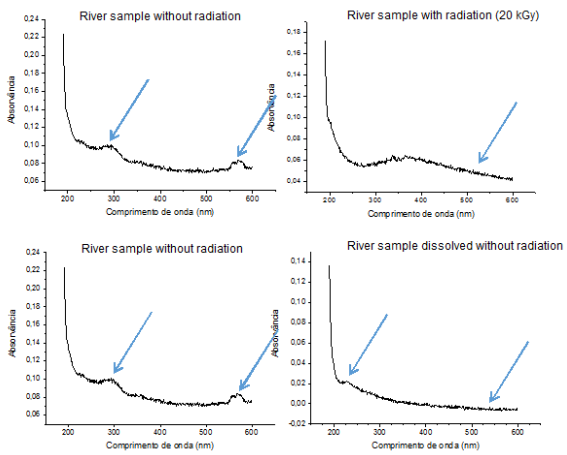
Thus, the use of advanced oxidation processes (AOP) in the elimination of organic matter present in the water samples has the advantage of non-destruction, but a phase shift. Water samples from groundwater in Taiaçupeba reservoir area, in the Metropolitan Region of São Paulo, were treated by gamma radiation. The water sampling was taken in two periods, dry season and wet season, in six monitoring wells, and also a blank sample from the Taiaçupeba river. The irradiation-absorbed dose of 20 kGy was enough to release complexed metals of organic matrix presents in water samples. Metals, as aluminium and zinc, were present in high concentrations and in its dissolved form that implying a potential risk of toxicity to living organisms.

Table 1 shows the results obtained by ICP-OES technique for irradiated and non-irradiated samples.

Sample	Al dissolved		Pb dissolved		Zn dissolved		Mn dissolved		Fe dissolved	
	0 kGy	20 kGy	0 kGy	20 kGy	0 kGy	20 kGy	0 kGy	20 kGy	0 kGy	20 kGy
Well F1	ND	0,2 0,03	ND							

<LQ
0,04
0,555?0,077
0,9
0,999?0,15
45,20
50,070?7,57
Well F2
ND
0,31?0,045
ND
<LQ
0,04
0,372?0,052
1,85
(2,595?0,38)*5
64,61
71,240?10,77
River
ND
0,28?0,041
ND
<LQ
0,10
0,185?0,026
0,05
0,052?0,0076
0,42
0,427?0,065
LQ
0,05
0,005
0,005
0,005
0,05

UV-vis technique was used to verify the absorption in the samples. Thus, the total non-irradiated sample was compared to the total sample irradiated with a dose of 20 kGy. It was found that there was a small decrease in absorbance in the irradiated sample, which demonstrates the release of the organic matter from the matrix analysed (Fig. 1). In the same vein, a comparison was made of the absorbance between the total water sample not irradiated with dissolved sample not irradiated. A lower organic matter filtered sample, i.e. the dissolved sample exhibited a lower absorbance. Once absorbance comparison was made between the sample and the total radiated filtered sample irradiated all at a dosage of 20 kGy. The conclusion was that the dissolved sample showed low absorbance



The AOP by gamma radiation is an efficient physical way to destroy organic compounds, as long as the radiation parameters delivered are correctly applied. Under the experimental conditions imposed in the present study, the optimal doses were defined and the applicability of a laboratory experiment like this should be further tested in the field using a pilot plant.