

# NATURAL RADIOACTIVITY IN WALL PAINTS: PRELIMINARY RESULTS

**Leandro M. FONSECA and Brigitte R. S. PECEQUILLO**

Instituto de Pesquisas Energéticas e Nucleares, Avenida Professor Lineu Prestes, 2242, Cidade Universitária, São Paulo-SP, Brazil. Email: [lmfonseca@ipen.br](mailto:lmfonseca@ipen.br)

Naturally occurring radionuclides with half-lives of the same order that the age of the earth, like  $^{40}\text{K}$  and the radionuclides from the  $^{238}\text{U}$  and  $^{232}\text{Th}$  series, are the major source of exposure for mankind. Buildings and houses are very important in human life, cause quite a lot of the lifetime is spent at home and / or office. Virtually, every building material contains the natural radionuclides  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$ . Knowledge of the levels of natural radioactivity in building materials is important for the assessment of population exposure to natural radioactivity, since most passes 80 % of your life in the residences.  $^{238}\text{U}$  is 99.27 % of natural uranium that is found throughout the earth's crust in the form of uranium and trace amounts in all kinds of rocks and minerals. Thorium is found in many rocks and soils with 100%  $^{232}\text{Th}$ . Several studies have been conducted to evaluate natural radioactivity in building materials such as rocks, granites, marbles, sand, etc., however, to date, there are no studies concerning the natural radioactivity that eventually the wall paints used internal or externally in buildings and houses used could contain. The wall paints, as others construction materials, has natural radionuclides originated from the mineral compounds used in its manufacturing process. The titanium dioxide used as the white pigment in paints, is produced from the processing of ilmenite minerals, representing 92% of the world demand of titanium minerals. As monazite, the main ilmenite radioactive contaminant, contains 1 to 20% thorium dioxide and also some uranium traces, it is easy to assume that wall paints could contain radioactivity. In this work, the activities concentrations of several wall paints will be evaluated in order to assess possible incremental exposures of workers and the public. Nowadays, seven wall paint samples were already analyzed. Each sample was tightly sealed in 100 mL HDPE flasks with a plan screw cap and bubble spigot and measured during 150 ks with an extended range HPGe detector of 35% relative efficiency, after approximately 4 weeks resting, in order to ensure secular equilibrium. The acquired spectra were analyzed using the InterWinner 6.0 software. The activity of  $^{40}\text{K}$  was calculated through its single gamma transition of 1461 keV. The activity of  $^{226}\text{Ra}$  was determined by the weighted mean of the  $^{214}\text{Pb}$  and  $^{214}\text{Bi}$  gamma transitions and the activity of  $^{232}\text{Th}$  by the weighted mean of the  $^{212}\text{Pb}$ ,  $^{212}\text{Bi}$  and  $^{228}\text{Ac}$  gamma ray transitions. The activities concentrations of the natural radionuclides varied from  $3.13 \pm 0.21$  up to  $14.1 \pm 0.5$  Bq/kg for Ra-226; from  $5.9 \pm 0.3$  up to  $46.0 \pm 1.5$  for Th-232 and from  $6.9 \pm 2.4$  up to  $195 \pm 28$  for K-40. Further, the study will be extended to a larger number of wall paints brands available in Brazil and eventual radiological consequences of absorbed dose will be assessed.