

Natural radiation and geochemistry of the Lamas de Olo biotite granite, northern Portugal

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At about 300 Ma, the emplacement of Fe-K subalkaline granites in the Central Iberian Zone was controlled by the brittle phase of deformation (D4). The Lamas de Olo (LO) granite, with ~297 Ma old (ID-TIMS U-Pb on zircon and monazite), is one of those examples. The LO granite is a medium- to coarse-grained, porphyritic biotite granite, which crops out in a rounded pluton, controlled by NE-SW and NW-SE fracture systems. The LO granite consists of quartz, microcline, zoned plagioclase (An₃₅-An₁₂), biotite, zircon, tourmaline, apatite, monazite, ilmenite, magnetite, rutile and rarely allanite and xenotime. It shows an ASI variable between 1.05 and 1.15 and signatures of $(87\text{Sr}/86\text{Sr})_i = 0.7038$ to 0.7045 and $\epsilon\text{Nd} = -1.7$ to -0.6 , suggesting the involvement of mid-crustal sources, probably mixed with asthenospheric material, in its origin. The U and Th average contents of the LO granite are 9.6 ppm and 17.0 ppm, respectively. These values are higher than the crustal average, showing a significant radon potential. SEM and electron microprobe studies indicate that U and Th are mainly concentrated in zircon, monazite, allanite and xenotime. The radioactive background of LO granite has been assessed using a gamma-ray portable spectrometer, which have shown differences in their U (7-20 ppm) and Th (17-28 ppm) contents that are in agreement with the whole rock analytical data. In the LO granite an average gamma ray flux of 143 $\eta\text{Gy/h}$ was measured with the detector 1 m above the rock. The LO granite pluton is cut by E-W trending fractures, commonly affected by episienitization processes. In these E-W fractures there is a moderate U enrichment (21.8 ppm) and gamma ray fluxes up to 220.4 $\eta\text{Gy/h}$. The U and Th contents of the LO granite are well correlated with indoor radon concentrations measured in four dwellings with CR-39 passive detectors. The average radon levels (145 Bq.m⁻³) not exceed the indoor radon recommended value of 200 Bq/m³, suggesting that the LO granite presents a moderate radon risk in dwellings. Acknowledgements: Thanks are due to Petrochron project (PTDC/CTE-GIX/112561/2009) and Geosciences Center.