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**Preliminary measurements of natural radioactivity in the Copper Mine at Sin-Quyen
LaoCai in North Vietnam**

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Abstract

The copper open pit deposits are localized at Sin-Quyen, district Bat Xat, province Lao-Cai in North - West Vietnam. Since 2006 the exploitation, enrichment and smelting of the copper metal have been active. Every year the product of copper metal amounts to above 12.000 tones, the deposit exploitation amounts to near one million tones and 6 millions cubic meters of the spoil rocks are excavated and removed.

To invest the radiation field in copper mine and assess the impact of the mining on the environment, the measurements of the natural radioactivity and dose rate in the mine area, solid and water samples collected from the mine and from the surroundings regions were carried out. The measurements on the field were performed using the portable gamma spectrometer GF-512™ Czech product. The collected rock and water samples were analyzed by gamma spectrometer with HPGe semiconductor detector and radiochemical methods respectively.

The ⁴⁰K, ²³⁸U and ²³²Th concentrations measured directly on the field ranged in the intervals of 1.56 to 4.7 %, 5.5 – 87.1 ppm and 6.0 – 33.2 ppm respectively. The dose rates were contained from 103.2 to 581.4 nGy/h and observed variation of it was principally related to the uranium concentration variation. The uranium in deposit increases with increasing of the copper metal, such phenomena were also observed by Niewodniczański in the case of Cu-Ag Deposit in Lubin, Poland .

The concentrations of radium isotopes (²²⁶Ra, ²²⁸Ra) were moderate and ranged from lower limit detection (5 mBq/dm³) for the water samples collected from the Red River and tab water to several hundreds mBq/dm³ for the water in mine and retention reservoir. However the uranium isotopes concentrations generally were significantly higher and varied from tens mBq/dm³ for the river water to several tens Bq/dm³ for the water samples collected from the mine and reservoir.

Based on the obtained data one can state that currently the copper mining and smelting activities do not significantly enhanced radioactive contamination on the surrounding environment.

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