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Production and characterization of ultra-pure copper for low background applications

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About two tons of ultra pure copper has been produced as a material for construction of an internal shield of a low-background gamma spectrometer. In the process several companies were involved. Aurubis A.G. (Germany) has prepared a dedicated casting mould, selected the best possible raw material (Cu cathodes) with respect to chemical composition and cast the 2-ton block. In order to minimize the cosmic exposure the block was immediately transported and stored underground, 150 m below the surface in the Wieliczka Salt Mine (Poland). It was taken out only for short time for forging (Zarmen S.A., Poland), cutting and fabrication of the shield components.

The radio-purity level of the copper was determined by analyzing: the long lived U/Th isotopes with an ICP mass spectrometer, Ra-226 and other gamma emitters by high-sensitivity germanium spectrometry and Pb-210 by a dedicated technique based on Po-210 separation from Cu and determination of its activity. The results showed very high purity of the material and, as expected, disequilibrium between different parts of the U-chain.

In the presentation the details of the production and analysis of the material will be given.

Primary author: ZUZEL, Grzegorz (Jagiellonian University, Krakow, Poland)

Co-authors: MROZ, Tomasz (Jagiellonian University, Krakow, Poland); Dr PEREZ PEREZ, Javier (Jagiellonian University, Krakow, Poland); Prof. WOJCIK, Marcin (Jagiellonian University, Krakow, Poland); STOCH, Slawomir (Wieliczka Salt Mine, Wieliczka, Poland); LAUBENSTEIN, Matthias (Laboratori Nazionali del Gran Sasso, Assergi, Italy)

Presenter: ZUZEL, Grzegorz (Jagiellonian University, Krakow, Poland)

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