



E I N L A D U N G

zum

V E R A - S E M I N A R

von

Stanislaw CHALUPNIK

Central Mining Institute, Katowice, Poland

**Radium isotopes in mine waters in Poland – occurrence,
impact on the natural environment, mitigation measures**

Saline waters from underground coal mines in Poland often contain natural radioactive isotopes, mainly ^{226}Ra from the uranium decay series and ^{228}Ra from the thorium series. More than 70% of the total amount of radium remains underground as radioactive deposits due to spontaneous co-precipitation or water treatment technologies, but several tens of MBq of ^{226}Ra and even higher activity of ^{228}Ra are released daily into the rivers along with the other mine effluents from all Polish coal mines. Mine waters can have a severe impact on the natural environment, mainly due to its salinity. Additionally high levels of radium concentration in river waters, bottom sediments and vegetation were also observed. Sometimes radium concentrations in rivers exceeded 0.7 kBq/m^3 , which was the permitted level for waste waters under Polish law. The investigations described here were carried out for all coal mines and on this basis the total radium balance in effluents has been calculated. Measurements in the vicinity of mine settling ponds and in rivers have given us an opportunity to study radium behaviour in river waters and to assess the degree of contamination. For removal of radium from saline waters a method of purification has been developed and implemented in full technical scale in two of Polish coal mines. The purification station in Piast Colliery was unique, the first underground installation for the removal of radium isotopes from saline waters. Very good results have been achieved - approximately $6 \text{ m}^3/\text{min}$ of radium-bearing waters were treated there, more than 100 MBq of ^{226}Ra and ^{228}Ra remained underground each day. Purification has been started in 1999, therefore a lot of experiences have been gathered during this period. Since year 2006, a new purification station is working in another colliery, Ziemowit, at the level -650 meters. Barium chloride is used as a cleaning agent, and amount of water to be purified is reaching $9 \text{ m}^3/\text{min}$. Technical measures such as inducing the precipitation of radium in gobs, decreasing the amount of meteoric inflow water into underground workings etc., have been undertaken in several coal mines, and as a result of these measures the total amount of radium released to the surface waters has diminished significantly during the last 15 years.

Donnerstag, 19. Februar 2009, 16:30 Uhr

**1090 Wien, Währinger Str. 17, "Kavalierstrakt",
1. Stock, Victor-Franz-Hess-Hörsaal**