Preface

In October 1995 the First International Conference on Uranium Mining and Hydrogeology took place with 350 participants from 30 countries (e.g. Canada, China, Czech Republic, Russia, and United States) at TU Bergakademie Freiberg in cooperation with the Saxonian State Ministry for Regional Development and the Environment and a significant financial support from this state authority. The aim of the conference had been to discuss the danger for surface- and groundwater by former uranium mines, uranium treatment plants, heaps and tailings and appropriate cleanup technologies as well as modeling tools. At this time shortly after the end of the cold war most uranium mines were or had already been closed down, the environmental risk of the uranium brownfields became obvious and public awareness rose.

Although the closure of uranium mining and milling facilities was a worldwide phenomenon at that time Freiberg was probably the most suitable city for the conference. This is because Freiberg is home of the oldest still operating mining university (Technische Universität Bergakademie Freiberg) in the world founded in 1765 on the one hand and because the city was in direct vicinity to the uranium mining and milling sites of the former GDR (East Germany) which was the third biggest producer of uranium from 1947 to 1990 on the other hand. Communication during UMH I was facilitated with the help of simultaneous interpreters. The conferences to follow (UMH II to UMH VII) were solely based on English as communication language and accompanied the rehabilitation and cleanup of uranium brownfields in Germany as well as in many other countries worldwide. In many countries nowadays this job is more or less done. However, in some countries such as Kirgizstan and Kazakhstan uranium mining and milling areas are still waiting for a proper aftercare.

Past challenges were countless mistakes and carelessness related to mining, milling and processing of uranium that contaminated surface- and groundwater. Other topics had been advantages, disadvantages and needs for modeling tools, analytical problems, quality and uncertainties of thermodynamic data, risk assessment studies, and phosphate mining. Because phosphate often contains uranium, thorium, and radium phosphate fertilizers contain considerable amounts of uranium and thorium which are recklessly spread on agricultural soils and thus in the long term endanger surface- and groundwater.

Future challenges will focus on the situation after most of the uranium brownfields have been cleaned up. However, uncertainties of thermodynamic data and the lack of kinetic and sorption data will be a topic of future research. Another future topic will probably be the development of environmentally friendly technologies for nowadays uranium mining and mining of ores that contain significant amounts of radioactive elements, respectively (e.g. many REE ores and phosphate). Therefore, further efforts have to be made to develop efficient and low-cost techniques to extract uranium from phosphates and REE-containing ores. This has to be accompanied by the definition of limits by state authorities for permissible uranium and thorium concentrations in fertilizers and naturally occurring radioactive materials (NORM). Mining phosphates and REE ores will have to consider radioactivity as an additional risk. This might have the positive side-effect to trigger the development of new mining techniques based on robotics and remote-controlled operations.

Although worldwide efforts are made to expand the use of alternative energies it is rather likely that nuclear energy utilization in future will continue to play an important role worldwide for at least several decades. Thorium reactors might be the basis for a worldwide renaissance of producing electricity and heat by means of nuclear technologies because a reactor meltdown seems to be close to impossible for a thorium reactor and proliferation risk is much lower than for uranium. Furthermore, thorium reactors produce less and only short-living radioactive waste and ^{232}Th is about 500-times more abundant than ^{235}U.

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