The similarities between alum shale and heap leaching of low grade uranium ores

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Abstract

Alum shale is a uranium-rich black shale whose chemistry share several traits with the chemistry of anthropogenic heap leaching of low grade uranium ore. In the past, several uranium heap leaching facilities have caused environmental damage such as acid rock drainage and heavy metal pollution of land and rivers.

Alum shales in Norway have an average activity concentration barely above the IAEA definition of NORM, i.e. with an activity concentration of 1 Bq/g or above. Alum shale are a known source of radon, but the radiation from the shale itself is usually negligible. However, if the chemistry of alum shale is similar to the chemistry of heap leaching, the potential for environmental damage could be similar as well. This could have impact on how alum shale should be handled and deposited and thus needs to be addressed.

Even though previous works has failed to address the similarities between the chemical processes of alum shale and heap leaching, alum shale, uranium chemistry and heap leaching are by themselves well-researched topics. Therefore, an assessment of the similarities between alum shale and heap leaching has been done through literature reviews and results from previous investigations into a case study. The case study come from an area where alum shale has previously been deposited in the environment without the proper means to hinder oxidation of uranium and the following uranium-rich leachate into the environment. The result of this evaluation highlight the need to handle alum shale as a potential environmental threat.