

In-situ emplacement of permanent barriers in earth formations

Armin Hassanzadeh, Jack Bridges

Pyrophase Inc, USA

A major concern regarding oil shale utilization is the presence of various hazardous substances in spent shale that can threaten water supplies. One method of mitigating this threat is to install an impermeable barrier around oil shale deposits being developed to prevent contaminant migration. Our approach is to apply radio frequency (RF) heating to oil shale deposits to evaporate the water and leave the targeted regions at an elevated uniform temperature. These steps condition the dry surface to accept a sealant that readily flows into the pore spaces of the warm, dry region and that solidifies as the rock cools. Our design studies have demonstrated that vertically spaced, three-electrode arrays can be installed from the surface and used to produce uniform RF heating. Application of RF heating can also be used to generate oil from oil shale or tar sands deposits. Various combinations of sealants with soils, sandstone and clays were evaluated. Fifty percent pore saturation of the sealant appears to be adequate for significant permeability reduction. Low molecular weight waxes and paraffins are best suited for impregnation. As constrained by the heating pattern of the electrode array, the injected sealant migrates into the pores, impregnates the earth formation and occupies the heated porous formation around the electrodes. The impregnated sealant is permanent and requires no further action after the region cools down. How the in situ heated portion develops and how it cools down will be analytically demonstrated. Applications of this approach include installing a permanent barrier between an oil shale in situ processing system and nearby aquifers and containing leakage from storage tanks or disposal sites. Illustrations of the barrier and other concepts for isolating hazardous materials are presented. The above noted program was part of much larger effort to decontaminate or sequester hazardous waste spills. US patent 4,900,196 documents some of the data presented here.