Oil shale wastewater treatment using high frequency ultrasound techniques

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Wastewater generated by the processing of Jordanian oil shale is rich in pollutants and cannot be easily treated. This work presents an experimental pilot design for the ultrasonic technique with high frequency to treat wastewater resulting from Jordanian oil shale retorting (JOSR), which is known as retort water. Work is currently underway to determine the efficacy of the ultrasonic technique as an initial step toward the development of a large-scale unit for the treatment of retort water. To maintain a constant temperature, the experiments were performed in a cylindrical glass water-jacketed reactor (internal diameter 6.35 cm and height of 25 cm). At the bottom of the column, an ultrasound vibrator cell was fixed. The cell was comprised of a 0.020 m diameter transducer, containing piezoceramics (sandwich) with copper end masses leading the face from which the ultrasonic energy is emitted at 1.7 MHz. The spent wastewater volume used was varied, while the ultrasound wave frequency and the exposing time were fixed. Spent wastewater samples before and after the ultrasound exposure were analyzed by mass spectrometry, and all scanned heavy metals that have been identified to be existing in retort water are listed in this work. The results indicate that using ultrasonication technique is an efficient method for the treatment of retort water.