Fate and chemical fraction distribution changes of arsenic and mercury during ultrasonic sludge treatment process

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ABSTRACT

Arsenic and mercury are typical elements with high toxicity found in sewage sludge, and only low content of them could cause severe environmental risks. Therefore, changes of arsenic and mercury during sludge treatment and disposal should be concerned. In this study, ultrasound irradiation was used for sludge treatment. The contents and chemical fraction changes of arsenic and mercury during sludge sonication were investigated in detail. Results showed that arsenic and mercury were released from sewage sludge into the aqueous phase by sonication. The concentrations of arsenic and mercury in the aqueous phase increased steadily during 30 min of sonication. The release of arsenic was higher than that of mercury (58% vs. 26%), since the content of unsteady chemical fractions of arsenic in sludge was high. Sonication enhanced the stability of arsenic and mercury in sludge. For arsenic, the unsteady fraction decreased from 85.0% to 0.0% and transformed into a stable fraction after 30 min of sonication. For mercury, the chemical fractions changed little during sonication due to the high content of stable fractions in mercury. Furthermore, a ‘concentration’ phenomenon of arsenic and mercury in the solid phase occurred during sonication. Additionally, contents of arsenic and mercury in sludge after sonication met Chinese legal standards.

Keywords: Sonication; Arsenic; Mercury; Solubilization; Chemical fractions

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