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## EFFECTS OF ULTRASONIC COORDINATED MICRO-BUBBLES ON SLUDGE PRETREATMENT AND DEWATERING CHARACTERISTICS

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### Abstract

When sludge produced by sewage treatment plants is improperly treated, it causes secondary pollution to the environment. Direct treatment is time-consuming, labor-intensive, and consumes enormous resources; therefore, pretreatment is required before sludge discharge. Sludge treatment with ultrasonic coordinated micro-bubbles revealed that at 30 s of ultrasonic treatment time, 450 W of power, and 5 min of micro-bubble treatment time, the volatile fatty acids content was the highest at 204.64 mg/L. The sludge cracking was analyzed by the polysaccharide content in extracellular polymers substances. The total polysaccharide content was the highest (52.75 mg/L) when ultrasonic treatment was performed for 30 s. The types and distribution of dissolved organic matter in the supernatant were analyzed by three-dimensional fluorescence spectroscopy. Based on volatile fatty acids, the order of influence among the three factors is bubble treatment time > ultrasonic time > ultrasonic power, as shown by the response surface method experiment. After synergistic treatment with ultrasonic and micro-bubbles, the Fourier transform infrared spectroscopy showed a change in the chemical properties of the sludge, thus affecting the dewatering performance. Under the combined action of the two treatments, scanning electron microscopy showed that the sludge particles became smaller with a loose structure, which was beneficial to improving the dewatering characteristics. These results provide a basis for the industrial application of ultrasonic coordinated micro-bubbles sludge treatment.

**Keywords:** micro-bubbles, polysaccharide, sludge, ultrasonic, volatile fatty acids

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