Bioremediation of sulfate-rich wastewater using lactate-fed sulfidogenic enrichment culture predominantly *Desulfovibrio sp.*: Box-Behnken design optimization

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**A B S T R A C T**

In this study, a sulfidogenic enrichment culture was obtained from lignite mine spoils and utilized for the remediation of sulfate-rich wastewater. By 16S rRNA analysis, the enrichment culture was identified to be predominantly *Desulfovibrio sp.* strain VSV1. Lactate was proved to be the suitable electron donor for the enrichment culture when compared with other volatile fatty acid salts such as formate, acetate, and propionate. By controlling one parameter at a time while others fixed, the parameter such as pH, temperature, and sulfate concentration was optimized as 8, 30°C and 1500 mg/L respectively. This study further investigated on mathematical optimization using Box-Behnken design followed by response surface methodology which yielded the optimum values as pH 7.7, temperature 30°C and sulfate concentration 1392 mg/L. The experimentally optimized multiple process parameters resulted in 95.5% of sulfate reduction comparatively higher than that obtained from single parameter optimization. The results of the present study suggested that the lactate-fed sulfidogenic enrichment culture can be effectively utilized for the remediation of sulfate-rich wastewaters.

**Keywords:** Sulfidogenic enrichment culture; Mine spoils; *Desulfovibrio sp.*; Sulfate-rich wastewater; Lactate; Box-Behnken design