# Enhanced growth-driven stepwise inducible expression system development in haloalkaliphilic desulfurizing bacteria *Thioalkalivibrio versutus*

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Highly toxic and flammable $H_2S$ gas has become an environmental threat. *Thioalkalivibrio versutus* is an autotroph that can transform reduced sulfur species, such as sulfide $S^{2-}$ and thiosulfate $S_2O_3^{2-}$ to sulfur, in the form of extracellular globules via oxidation. Haloalkaliphilic autotrophs, like the bio-desulfurizing *T. versutus*, grow weakly. Weak growth makes any trial for developing potent genetic tools required for genetic engineering far from achieved. In this study, the fed-batch strategy improved *T. versutus* growth by 1.6 fold in maximal growth rate, 9-fold in O.D600 values and about 3-fold in biomass and protein productions. The strategy also increased the favorable desulfurization product, sulfur, by 2.7 fold in percent yield and 1.5-fold in diameter. A tight iron-inducible expression system for *T. versutus* was successfully developed. The system was derived from fed-batch cultivation coupled with new design, build, test and validate (DPTV) approach. The inducible system was validated by toxin expression. Fed-batch culturing coupled with DBTV approach successfully led to the first tight inducible system construction in *T. versutus* for improving bio-desulfurization processes by future metabolic engineering. The selected inducible system heterologously expressed the MazF toxin at high $O.D_{600}$ value as a validation step. It lets the strain grow much faster than the control. The Fed-batch cultivation coupled with DPTV approach could be applied to other autotrophs.
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**Research Interests:**

Genome editing and Metabolic Engineering of Microbes

Biodesulfurization of Natural Gas, Bio-Gas, and Waste Gases with Haloalkaliphilic Microbes

Bioaugmentation and Biotreatment of Industrial Wastewater

**Selected publications**


1. Xing et al., *Bioresource Technology,* 2019, accepted.
2. Xing et al., *Bioresource Technology,* 2018, 268: 45-51.
3. Xing et al., *Bioresource Technology*, 2018, 266: 26-33.
4. Xing et al., *Bioresource Technology*, 2018, 265: 443-449.
5. Xing et al., *Bioresource Technology*, 2016, 214: 653–659.