Mine Pollution Control

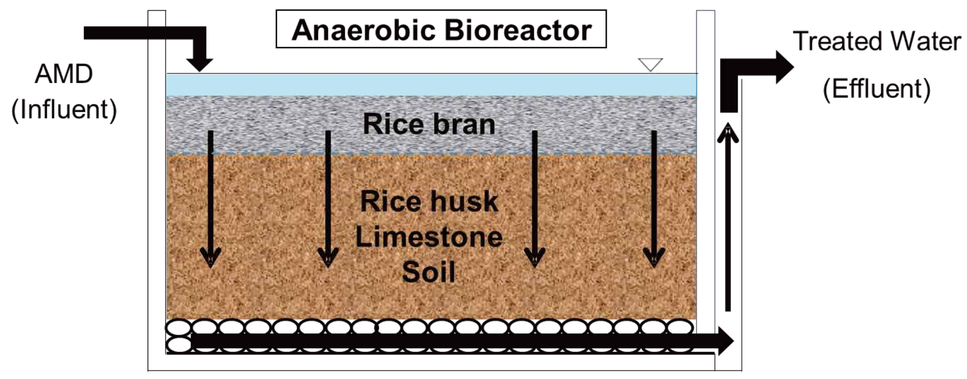
“Compact” Passive Treatment System Using Agri-waste for Acid Mine Drainage (AMD)

Metals Environment Management Department

Research and development

JOGMEC has been carrying out development of “JOGMEC process”; one of the passive treatment systems, for cost reduction for AMD treatment. JOGMEC process is a vertical flow anaerobic process using sulfate-reducing bacteria (SRB) with rice bran and rice husk (agri-waste) as organic substrates.

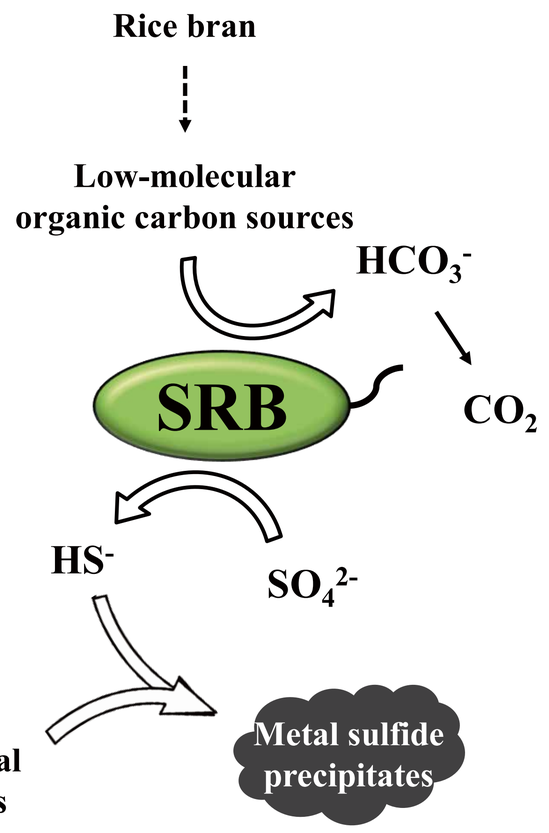
Scheme of JOGMEC process



Metal removal mechanism of JOGMEC process

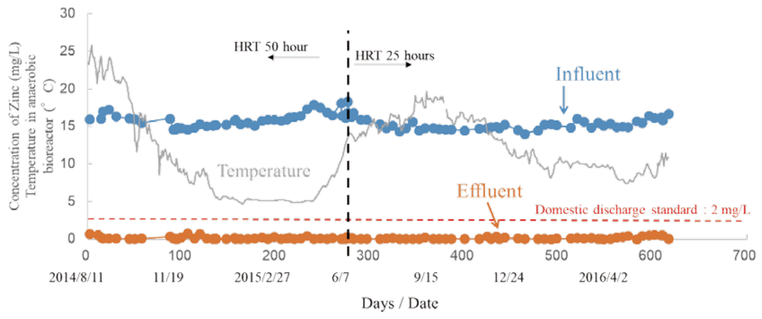
1. Production of low-molecular organic carbon sources (deriving from rice bran) by heterotrophic aerobes and consumption of dissolved oxygen in the surface layer (contributing to anaerobic environment in the under layer)
2. SRB growth using the low-molecular organic carbon sources and following microbial sulfate reduction
3. Formation of metal sulfide (CdS, ZnS, PbS, CuS, etc.) in a reaction between metal ions in AMD and hydrogen sulfide ions produced by SRB
4. Trapping sulfide precipitates on the surface of rice husk

Metal removal mechanism

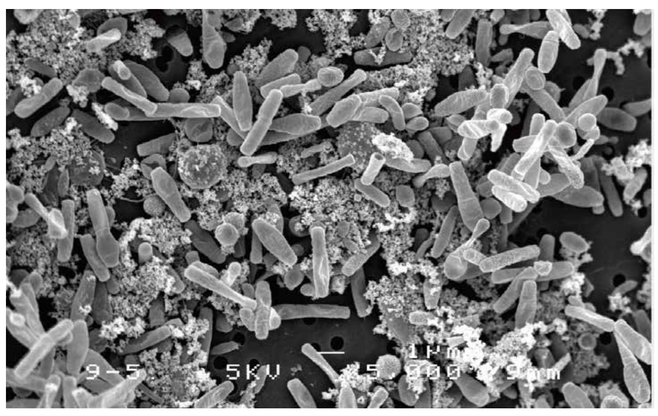


Zn removal efficiency by JOGMEC process

- Zn ions had been stably removed (99% removal) through the JOGMEC process, and its concentration in effluent was below domestic discharge standard of Zn (2 mg/L) during the test term.
- Other metal ions (Cu, Cd, Fe) had also been removed below their domestic discharge standards.



Pilot scale test plant



SEM image of SRB in the reactor

Column tests in Metals Technology Center

Ongoing subjects

- Shortening HRT (Hydraulic Retention Time)
- Prevention or re-utilization of excessive hydrogen sulfide ions and high concentration BOD / COD in treated water
- Prevention of shortcut phenomena in the reactors

JOGMEC