

PENGARUH ZEOLIT ALAM TERHADAP AKTIVITAS KONSORSIUM BAKTERI PEREDUKSI SULFAT DALAM PENGENDAPAN LOGAM Mn

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ABSTRAK

Penelitian ini difokuskan untuk mengetahui pengaruh penambahan zeolit alam Wonosari terhadap aktivitas konsorsium Bakteri Pereduksi Sulfat yang berasal dari kotoran kambing, *sludge* sawah, dan *wetland* tambang batubara dalam mengendapkan logam Mn dengan menggunakan limbah sintetik.

Tujuan penelitian ini adalah untuk mengetahui pengaruh penambahan zeolit alam terhadap aktivitas konsorsium Bakteri Pereduksi Sulfat dalam pengendapan logam Mn skala *batch culture*, menganalisis pengaruh perbedaan ukuran zeolit terhadap pengendapan logam Mn dalam skala *batch culture*, menganalisis pengaruh penambahan zeolit alam terhadap aktivitas Bakteri Pereduksi Sulfat dalam pengendapan logam Mn skala *continous culture*, dan mengidentifikasi karakter biofilm Bakteri Pereduksi Sulfat oleh aktivitas konsorsium Bakteri Pereduksi Sulfat pada zeolit alam dalam skala *continous culture*.

Tahap penelitian meliputi aktivasi zeolit, optimasi substrat untuk pengujian aktivitas konsorsium Bakteri Pereduksi Sulfat; pengujian aktivitas konsorsium Bakteri Pereduksi Sulfat dalam skala *batch culture* dan *continous culture*; serta karakterisasi biofilm konsorsium Bakteri Pereduksi Sulfat.

Hasil penelitian menunjukkan bahwa konsorsium Bakteri Pereduksi Sulfat yang mempunyai aktivitas yang paling optimal dalam pengendapan logam Mn dalam skala *batch culture* adalah konsorsium Bakteri Pereduksi Sulfat yang berasal dari kotoran kambing. Ukuran zeolit yang paling optimum digunakan pada pengujian aktivitas konsorsium Bakteri Pereduksi Sulfat dalam pengendapan logam Mn adalah Zeolit I (0,8-1,2 cm). Konsorsium Bakteri Pereduksi Sulfat pada bioreaktor dengan penambahan zeolit (BZ) mempunyai aktivitas yang lebih efektif dibandingkan dengan bioreaktor tanpa penambahan zeolit (BTZ), dimana pH meningkat menjadi pH 6,9; konsentrasi akhir sulfat 1037 ppm, efisiensi pengendapan logam Mn sebesar 61,16%, serta nilai MPN yang lebih tinggi. Zeolit dalam bioreaktor dengan waktu pembentukan biofilm 5 hari dan 9 hari terlihat adanya biofilm konsorsium Bakteri Pereduksi Sulfat yang tumbuh melekat pada permukaan zeolit, dan diperoleh sebanyak 9 isolat Bakteri Pereduksi Sulfat yang mampu mereduksi sulfat dan mengendapkan logam Mn.

Kata kunci: *zeolit, Bakteri Pereduksi Sulfat, batch culture, continous culture, biofilm*

THE EFFECTS OF NATURAL ZEOLITE ON THE CONSORTIUM ACTIVITIES OF SULFATE REDUCING BACTERIA IN MANGAN (Mn) SEDIMENTATION

ABSTRACT

This research is focused to recognize the effects of adding natural zeolite from Wonosari on the consortium activities of Sulfate Reducing Bacteria derived from goat feces, field sludge, and wetlands of the coal mine in Mangan sedimentation by using synthetic wastewater.

The objective of this study were (1) determining the effects of natural zeolite addition on the consortium activities of Sulfate Reducing Bacteria in Mangan (Mn) sedimentation of batch culture scale, (2) analyzing the effects of different size of zeolite to the Mangan sedimentation of batch culture scale, (3) analyzing the effects of natural zeolite on the activities of Sulfate Reducing Bacteria in Mangan sedimentation of continuous culture scale, and (4) identifying the biofilm character of Sulfate Reducing Bacteria on consortium activities on natural zeolite using continuous culture scale.

The first studies was activation of zeolites, followed by substrate optimization for testing the activity of consortium Sulfate Reducing Bacteria; testing the activity of consortium activities of Sulfate Reduction Bacteria in batch culture and continuous culture scales; and biofilm characterization of Sulfate Reducing Bacteria consortium.

The results showed that the consortium of Sulfate Reducing Bacteria which had the most optimal activities in Mangan sedimentation of batch culture scale was the consortium of Sulfate Reducing Bacteria derived from goat feces. The most optimal size of zeolites used in the consortium activity test of Sulfate Reducing Bacteria in Mangan sedimentation was zeolite I (0.8 to 1.2 cm). The consortium of Sulfate Reducing Bacteria in the bioreactor with the addition of zeolite (BZ) had an activity that was more effective than the bioreactor without the addition of zeolite (BTZ), where the pH was increased to pH 6.9; concentrate of sulfate 1.037 ppm, Mangan sedimentation was 61,16%, and the higher MPN index. Zeolite in a bioreactor with biofilm formation in 5th days and 9th days seems that there were biofilm consortium of Sulfate Reducing Bacteria growing attached to the surface of the zeolite, and there were nine isolates of Sulfate Reducing Bacteria capable of reducing sulfate and Mangan (Mn) sedimentation.

Keywords: Zeolite, Sulfate Reducing Bacteria, Batch Culture, Continuous Culture, Biofilm