

**OPTIMASI PROSES *BIOLEACHING* BIJIH MANGAN (Mn)
DAN IDENTIFIKASI MOLEKULAR 16S rRNA
BAKTERI PENGOKSIDASI SULFUR**

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INTISARI

Sumber daya alam logam mangan (Mn) di Indonesia memiliki banyak potensi sebagai bahan baku industri metalurgi maupun non metalurgi. Hal ini memberi kesempatan Indonesia untuk meningkatkan hasil ekspor Mn keluar negeri. Proses ekstraksi bijih Mn selama ini tidak ramah lingkungan karena membutuhkan asam dan biaya tinggi. Salah satu penekan biaya tinggi dengan dilakukan optimasi *bioleaching* bijih Mn berdasarkan keasaman. Tujuan penelitian ini adalah optimasi keasamaan *bioleaching* bijih Mn oleh bakteri pengoksidasi sulfur, analisis kemampuan *bioleaching* isolat bakteri pengoksidasi sulfur terhadap bijih Mn, dan karakteristik molekular serta kekerabatan bakteri pengoksidasi sulfur sebagai agen pengekstraksi bijih Mn berdasarkan gen 16S rRNA. Koleksi isolat KB3B1 dan KB2B1 yang telah diisolasi dari pemandian belerang Ungaran ditumbuhkan pada medium yang mengandung besi dan sulfur (9K). Kemampuan pertumbuhan isolat yang mampu tumbuh pada medium 9K diukur dengan *Spectrofotometer UV-Vis*. Aktivitas *bioleaching* bijih Mn dilakukan dengan perlakuan variasi konsentrasi Mn (1% dan 2%) pada medium 9K dan 2% inokulum kemudian diamati selama 18 hari menggunakan *Atomic Absorption Spectrophotometry* (AAS). Isolat terpilih berdasarkan kemampuannya tumbuh optimum pada medium dengan perlakuan variasi konsentrasi bijih Mn dikarakterisasi secara molekular berdasarkan 16S rRNA. Hasil penelitian menunjukkan kedua isolat BOS KB2B1 dan KB3B1 memiliki kemampuan tumbuh baik pada saat proses *bioleaching* Mn karena dapat mengalami fase eksponensial dan stationer hingga hari ke-15. Nilai pH selama proses *bioleaching* mengalami penurunan yang tidak signifikan menjadi pH 6 dari nilai pH awal sebesar 7 (netral). Penurunan pH disebabkan produksi sulfat sehingga menyebabkan pelarutan bijih Mn. Efisiensi *bioleaching* (pelarutan) bijih Mn tertinggi untuk isolat KB3B1 yaitu pada hari ke-15 untuk isolat KB3B1 yaitu sebesar 27,78%. Hasil konstruksi filogeni menunjukkan bahwa KB3B1 merupakan bakteri yang memiliki kecenderungan atau teridentifikasi *Bacillus niacini* strain EP89 dan *Bacillus drentensis* strain BF-R7.

Kata kunci: bakteri oksidasi sulfur, *bioleaching*, mangan, 16S rRNA.

OPTIMIZATION OF BIOLEACHING PROCESS OF MANGANESE (Mn) ORE AND MOLECULAR IDENTIFICATION OF 16S rRNA SULFUR- OXIDIZING BACTERIA (SOB)

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ABSTRACT

Natural Resources of Manganese (Mn) metal in Indonesia have as a lot of potential as metallurgy and non-metallurgy industry raw materials. It provides an opportunity for Indonesia to increase the export of Mn to other countries. So far, the extraction process of Mn ore is not environmentally friendly since it needs acid and high cost. One of the ways to reduce the cost is by optimizing the *bioleaching* of Mn ore based on the acidity. The aim of this study was optimization of the acidity of the Mn ore *bioleaching* by sulfur-oxidizing bacteria, analysis of *bioleaching* of sulfur-oxidizing bacteria isolate to Mn ore, and molecular identification of two isolate of bacteria that are involved in *bioleaching* of manganese ore. of sulfur-oxidizing bacteria as the extraction Mn ore extraction agent based on 16S rRNA gen. KB3B1 nad KB2B1 isolates collection was has been isolated from Ungaran sulfur bathing place were grown on iron and sulfur medium (9K). The isolate growing ability which could grow on the 9K medium was measured using *Spectrophotometry UV-Vis*. The Mn *bioleaching* activity was done in some variation of Mn concentration; (1% and 2%) on 9k medium and 2% inoculum and then being observed for period of 18 days using *Atomic Absorption Spectrophotometry (AAS)*. The isolates were selected based on their ability to grow optimally on the medium by treatment of variations in Mn ore concentration characterized molecularly based on 16S rRNA. The research results showed that both isolates SOB KB2B1 and KB3B1 has a good ability to grow during the Mn *bioleaching* process since it could experienced exponential and stationary phases until the 15th day. The pH value during the *bioleaching* proces did not significantly decreased to pH 6 from the initial pH value of 7 (neutral). The decrease of the pH value was caused by sulfate production resulting in the dissolution of the Mn ore. The highest *bioleaching* efficiency of Mn was for KB3B1 isolate in on day 15; that was 27,78%. The phylogenetic construction results show that KB3B1 is a bacterium with a predisposed or identified between *Bacillus niacini* strain EP89 or *Bacillus drentensis* strain BF-R7.

Key words: *sulfur-oxidizing bacteria (SOB), bioleaching, manganese, 16S rRNA*