CONTEMPORARY METALLIC MATERIALS

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Abstract: In the viewpoint of environment preservation and efficient utilization of resources, a series process has been developed to utilize limonitic ore. Limonite is mineral content in laterite sediment with low Ni content and nickel laterite mining waste that can be an alternative raw material of iron making due to its high iron content. Upgrading of the ore was started with magnetization using mixed carbon monoxide and carbon dioxide gases at desired temperature then followed by leaching of the magnetized sample in sulphuric acid media. The result indicated that magnetization can speed up the nickel dissolution and obstruct the iron dissolution. The dissolution rate of nickel was very high in the period of less than 5 min for magnetized sample. The nickel dissolution would be higher by prolonging the leaching time. However, leaching time would not increase the dissolution of both nickel and iron in the non-magnetized sample. Accordingly, magnetization of the ore can control the non-metallic dissolution in the leaching process such as iron oxide. At the end of the leaching process, there will be iron-rich residue with minimal nickel content and nickel-rich solution.

Introduction

Laterite ore is one of the mineral resources containing several kinds of metal elements, such as nickel, cobalt and iron. It is widely distributed in the equatorial region, such as India, Philippine and Indonesia, and is mainly used as a nickel resource. However, the utilization is limited to only the high grade nickel content. Over three decades of nickel refining operation, mining has centered predominantly on nickel containing ore to be fed to ferronickel smelter or nickel matte process. As a proven deposit, the top layer of nickel ore with high content of iron, those containing significant limonitic ore have been reviewed its possibility to be utilized in production of iron ore pellet as well as nickel containing pig iron [1,2]. Although the fundamental characteristics of lateritic ore have been reported in several literatures [3,4], further research on the mineralogical characteristics and reduction behavior of the ore is essential for further utilization as iron ore. When the high-grade Fe laterite is used for iron and steel industries, the complicated chemical structure brings about some difficulties. The high amounts of nickel and cobalt contents result in the low quality of the pig iron produced. Therefore, it is necessary to eliminate the nickel to get a useful laterite for iron-making.

Several methods have been reported to extract Ni using leaching by sulphuric acid, hydrochloric leaching or nitric acid, sulphating process, and so on [5-7]. One of the methods commercially applied is the direct pressure leaching using sulphuric acid (Moa Bay method)