

Article

Carbonation Curing on Magnetically Separated Steel Slag for the Preparation of Artificial Reefs

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Abstract: Magnetic separation is an effective method to recover iron from steel slag. However, the ultra-fine tailings generated from steel slag become a new issue for utilization. The dry separation processes generates steel slag powder, which has hydration activity and can be used as cement filler. However, wet separation processes produce steel slag mud, which has lost its hydration activity and is no longer suitable to be used as a cement filler. This study investigates the potential of magnetically separated steel slag for carbonation curing and the potential use of the carbonated products as an artificial reef. Steel slag powder and steel slag mud were moulded, carbonation-cured and seawater-cured. Various testing methods were used to characterize the macro and micro properties of the materials. The results obtained show that carbonation and hydration collaborated during the carbonation curing process of steel slag powder, while only carbonation happened during the carbonation curing process of steel slag mud. The seawater-curing process of carbonated steel slag powder compact had three stages: C-S-H gel formation, C-S-H gel decomposition and equilibrium, which were in correspondence to the compressive strength of compact increasing, decreasing and unchanged. However, the seawater-curing process of carbonated steel slag mud compact suffered three stages: C-S-H gel decomposition, calcite transfer to vaterite and equilibrium, which made the compressive strength of compact decreased, increased and unchanged. Carbonated steel slags tailings after magnetic separation underwent their lowest compressive strength when seawater-cured for 7 days. The amount of CaO in the carbonation active minerals in the steel slag determined the carbonation consolidation ability of steel slag and durability of the carbonated steel slag compacts. This paper provides a reference for preparation of artificial reefs and marine coagulation materials by the carbonation curing of steel slag.

Keywords: carbonation curing; steel slag powder; steel slag mud; seawater curing; artificial reefs

Separated By Steel

William Jerome Harrison



Separated By Steel:

Separation Technologies for Minerals, Coal, and Earth Resources Courtney Young, Gerald H. Luttrell, 2012 This book is an authoritative digest of the latest developments in the mineral processing industry Dozens of authors share their insights on how practitioners can develop earth resources more economically while simultaneously addressing vital factors ranging from sustainability to environmental stewardship The book examines coal processing surface forces and hydrophobicity process improvements and environmental controls dewatering and drying gravity separations industrial minerals flotation base metal flotation flotation equipment and practice process reagents magnetic and electrostatic separations modeling and process control and resource engineering Important current issues such as gas hydrates oil sands secondary materials metals and waste and process waters are also discussed *Magnetism and electricity*, by W.J. Harrison and C.A. White William Jerome Harrison, 1890 *Federal Register*, 1987-05-05 **The Iron and Steel Industry of the United States** Richard Hartshorne, 1929 *Industrial Solid Waste Recycling in Western China* Fenglan Han, Lan'er Wu, 2019-05-22 This book introduces the latest results in research and practice of industrial solid waste recycling in China's western regions where more than 50% of the waste in the whole country was produced With rapid development in recent years the massive industrial solid waste has become a serious problem in China This book summarizes information and results of several National Research Programs of China concerning the typical solid wastes of the metallurgical and energy industry in western China such as magnesium slag manganese slag acid sludge of lead and zinc smelting fly ash steel slag and carbide slag It will be highly beneficial to scholars and engineers of environmental science and engineering **Resource Utilization of Solid Waste by Thermometallurgy in Steel Processes** Kai Dong, Hongyang Wang, Zhenqiang Jiang, 2023-08-25 This book intends to summarize the current situation at home and abroad about the treatment and consumption of various metallurgical wastes and domestic waste fertilizers and their products through metallurgical processes It collects the process characteristics of the whole metallurgical process from sintering blast furnace electric furnace converter and other aspects as well as the process parameters for treating various solid wastes solves the problems that may be encountered in the relevant processes and puts forward corresponding solutions including the transformation of the process flow or the addition of some pre-treatment links In addition this book also evaluates some important production and digestion processes and puts forward relevant suggestions for readers to have a more comprehensive thinking University teachers graduate students researchers and engineers engaged in iron and steel metallurgy process especially those who use iron and steel process to absorb metallurgical solid waste and domestic solid waste together will be of great help to them *The Mineral Industry*, 1901 Investigation of Concentration of Economic Power United States. Congress. Temporary National Economic Committee, 1940 **The Journal of the Iron and Steel Institute** Iron and Steel Institute, 1919 Includes the institute's Proceedings *Electric Furnaces in the Iron and Steel Industry* Wilhelm Rodenhauser, I. Schoenawa, Carl Hans Vom

Baur,1913 Workshop Receipts for the Use of Manufacturers, Mechanics and Scientific Amateurs Ernest Spon,1896

Proceedings - Institution of Mechanical Engineers Institution of Mechanical Engineers (Great Britain),1883

Frontiers of Civil Engineering and Disaster Prevention and Control Volume 1 Yang Yang, Ali Rahman, 2023-01-16

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