

## Documents

Ismail, A.A.M., Rosdin, M.R.H., Hamid, A.M.A., Purwanto, H., Rozhan, A.N., Ani, M.H.

**Producing Blast Furnace Slag Cement Clinker by Utilizing Redox Reaction Approach**  
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Department of Manufacturing and Materials Engineering, Kulliyah of Engineering, International Islamic University Malaysia, Selangor, Gombak, 53100, Malaysia

**Abstract**

The demand and consumption of steel and concrete around the world is ever increasing as the construction of new buildings for residential and work purpose increased year by year. The higher production of steel leads to an increase in blast furnace slag waste which is the by-product of pig iron production. The tapping temperature of blast furnace slag is 1500 °C and hence the abundance of slag waste dumped at the landfill does not only used up a lot of space, but the amount of heat exposed to the atmosphere is enormous. Using appropriate redox reaction strategy, both slag and heat waste from iron production can be used for cement industry, which contributes to green economy. This work explores the potential to convert slag waste into cement clinker using direct heat from blast furnace of iron production. The mixture of blast furnace slag and limestone is introduced to produce cement clinker. The mixing composition of blast furnace slag and limestone is varied at weight percentage of 60, 70, and 74% calcium oxide (CaO) based on CaO–SiO<sub>2</sub> binary phase diagram. The results indicated that the slag clinker showing the alite and belite phase when characterized with XRD and the percentage of weight loss increase after annealing process. BET analysis shows that the higher the addition of CaO results in higher pore volume, which is proving the high percentage of weight loss. It could be observed from this experiment that the redox reaction taking place during annealing process changing the composition of slag clinker, thus determining the quality of clinker. The clinker produced with desirable quality as Portland cement is the mixing composition of 74% CaO. © 2023, The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd.

**Author Keywords**

Blast furnace slag; Cement clinker; Redox reaction

**Index Keywords**

Blast furnaces, Lime, Limestone, Mammals, Mixing, Portland cement, Redox reactions, Silica; Annealing process, Blast furnace slag cements, Cement clinker, Exposed to, Green economies, Iron production, Reaction strategies, Slag wastes, Weight loss, Weight percentages; Slags

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### **Correspondence Address**

Ani M.H.; Department of Manufacturing and Materials Engineering, Selangor, Malaysia; email: mhanafi@iiium.edu.my

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