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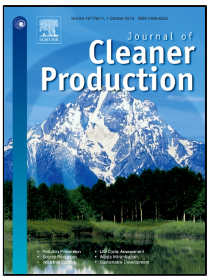

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Effect of charcoal derived from oil palm empty fruit bunch on the sinter characteristics of low grade iron ore

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ABSTRACT[1]

Iron and steel industries are major contributors to global CO_2 emissions. Biomass has been proposed as an alternative cleaner and renewable fuel to reduce emissions from these industries. During iron sintering a large amount of greenhouse gases is emitted; therefore, it is desirable to substitute fossil fuels with biomass. In this study, coke was substituted with charcoal derived from oil palm empty fruit bunch (EFB) as an alternative fuel for sintering of iron ore. The EFB was heated at 450 °C for 30 minutes to produce charcoal, and the mixture of iron ore mixed and charcoal was sintered by heating at various temperatures from 950 to 1150 °C in the presence of 1% limestone. The sintered particles coalesced to a larger extent at higher temperatures and the porosity significantly decreased. The average sinter particle density was found highest at 1150 °C. Sintering caused the porosity to decrease by ~50.42% between the highest (1150 °C) and lowest (950 °C) temperature. With increasing heating temperature, the compressive strength of the sinter significantly increased. The morphology suggested that melt formation facilitates the coalescence of small pores and irregularly shaped pores into more rounded shapes pores, thus reducing the number of larger pores. Meanwhile, the addition of charcoal content has a detrimental effect on the properties of sinter. By increasing the charcoal content attributed to the decrement of apparent density and compressive strength of the sinter. The use of charcoal from EFB as an energy source for sintering Malaysian iron ore can potentially reduce CO_2 emissions in iron-making processes approximately 183.3 kg per ton.

Keywords: sintering iron ore, charcoal, CO_2 emission

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