The effect of reduction time and size distribution of mixed iron ore with coconut shell charcoal on the percentage of metallization by using a rotary kiln

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Abstrak

Steel is an important material that is widely used and its development has occurred in conjunction with the history of mankind over the last two centuries. In general, the steelmaking process has been done through a combination of a direct reduction process and an Electric Arc Furnace (EAF) or an indirect reduction process and a Basic Oxygen Furnace (BOF). The combination of the steelmaking processes can be adapted to the specific conditions of Indonesian local iron ore. In Indonesia, the raw material reserves of iron and steel making are quite large, but spread over several islands. UPT BPML LIPI in cooperation with the Department of Metallurgical Engineering UNTIRTA conducted research to improve the economic value of the local iron ore in South Lampung Regency. The total amount of primary iron ore resources in South Lampung is estimated to be in the region of 11 million tons. South Lampung Regency iron ore is primary iron ore with a content of pure magnetite and magnetite-containing impurity silica levels ranging from 40-65% Fe in total. South Lampung Regency low-grade iron ore has the potential to be reduced by using a rotary kiln. A rotary kiln is a tool used to reduce low-grade iron ore and produce sponge iron with a high metallization. This process is in accordance with the Indonesian government policies that regulate the minimum value of percentage of sponge iron metallization for export, i.e. 85%. In this research, sponge iron is made of a mixture of Lampung iron ore pellets with coconut shell charcoal as a reduction agent. The composition of coconut shell charcoal is about 20%, which will determine the optimum amount of South Lampung iron ore pellets in the mixture. In addition, during the reduction process, the residence time of pellets in the rotary kiln is observed in order to obtain the optimal percentage of metallization. The method used in this research was the direct reduction process using a pilot-scale rotary kiln with the variables related to residence time (1, 2 and 3 hours) for the pellets and to the diameter of the pellets (-12+8mm and -20+12mm). Meanwhile, the reduction temperature was fixed, i.e. 1100oC. The maximum metallization of sponge iron achieved at a residence time of 3 hours was 99.50% for the average pellet diameter of (-12+8mm).