Development of an Experimental Fluidised Bed Reactor

for the Processing of New Zealand Titanomagnetite Ironsand

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ABSTRACT

Substantial deposits of titanomagnetite (TTM)ironsandare found throughout the west coast of the North Island of New Zealand (NZ). This titaniferous iron ore contains approximately 8% TiO2 equivalent, which prevents its use as a feedstock concentrate for conventional blast furnace (BF) processes. However, at present ~1.5 Mt pa is utilisedin therotary-kiln production of direct reduced iron (DRI), anda further > 1 Mt is exportedfor blending as a minority componentwithin BF sinters. However, the increased focus on reduced CO_2 emissions is now promotingrenewed interest in alternatives to existing carbo-thermic DRI approaches. Here, we report initial investigative work into the production of DRI from NZ ironsand via hydrogen-reduction in an experimental fluidized bed reactor.

NZ ironsand exhibits a naturally-occurring particle size distribution in the range 100-250 μm, making itpotentially well-suited to fluidized bed processing. Fluidized bed processing provides potential advantage fordirect use of ironsandpowder without pre-treatment of material such as pelletizing and sintering. In the current project, we have designed and commissioned a small-scale experimental reactor that enables fluidized bedreduction in Ar-H_2 atmospheres at up to 1050 °C. This experimental reactor includes a novel in-situ sampling system which utilises a micro-cyclone to extract smallamount of samples (< 5 g) of partially reduced material at specific time intervals during a batch reduction. We present initial results of the fluidized bed reaction of ironsandfrom this reactor. Also, we show that quantitative X-ray diffraction (q-XRD) is a useful approach to characterise the qualityof the reduced product.