Application of Carbonate Looping to Cement Industry - DTU Orbit (30/12/2018)

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In the present work, cycle experiments of different types of limestone, cement raw meal and a mixture of limestone and clay were carried out in laboratory scale setups at more realistic conditions (i.e. calcination temperature is 950°C and CO2 concentration is 80%) to simulate the performance of sorbents in carbonate looping processes. The results show that the CO2 carrying capacity of limestone is much lower at realistic conditions than at mild conditions, which are often used in laboratory experiments. BET and SEM analyses show that the surface area of calcined limestone decreases significantly with an increase in the CO2 partial pressure during calcination, indicating enhancement of sintering by the presence of CO2. As sorbents, cement raw meal and the mixture of limestone and clay show a similar trend as limestone with respect to the decay of the CO2 carrying capacity and this capacity is lower than that of limestone at the same conditions in most cases. SEM and XRD analyses indicate that a combination of severe sintering and formation of calcium silicates attributes to the poor performance of the cement raw meal.

**General information**

State: Published
Organisations: Department of Chemical and Biochemical Engineering, CHEC Research Centre, FLSmidth & Co. A/S
Contributors: Lin, W., Illerup, J. B., Dam-Johansen, K., Hjuler, K.
Number of pages: 8
Publication date: 2012

**Host publication information**

Title of host publication: Proceedings of the 21st International Conference on Fluidized Bed Combustion
Keywords: CO2 capture, Carbonate looping, Cement industry, Raw metal
Source: dtu
Source-ID: u::6499
Research output: Research - peer-review » Article in proceedings – Annual report year: 2012