(23) ON THE THERMAL DIFFUSIVITY OF SPONGE IRON AND SINTER (2)

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1. Introduction

The thermal diffusivity of a solid is of great importance for the melting behaviour, as well in the 'direct route' (electric arc furnace) as in the blast furnace (Bf).
The laser-flash-method (Fig.1) needs small discs for the measuring of the thermal diffusivity. By using special drilling equipment it is now possible to get discs directly from the solids.

2. Measuring set-up

The laser-flash-method uses a laser to rise the temperature of one side of the sample nearly immediately. For the apparatus used the sample is a disc of 20 mm in diameter and a thickness of about 2 mm. Special care has to be taken to get such discs out of the chosen material (sinter, natural pellets).

3. Thermal diffusivity of the samples

The great influence of the structure of the solid on the thermal diffusivity has already been reported (1,2). But these experiments (2) had been carried out with pressed powder. The new results for a prereduced sponge iron pellets (Fe_{met} 65%) are similare (Fig.2, ▲), though the value for low temperatures is higher.
Sinter and pellets from a 'softening and melting' equipment simulating a blast furnace (temperature 1350 C, pressure 1 kg/cm^2) were cut and measured (Fig 2, ✱, ●). Though the corresponding temperature of the samples is about 1350 C, the thermal diffusivity is observed for the whole temperature range. Due to the more porous material the value is lower than for presses powder (a) .

4 .Melting time of solids of different thermal diffusivity

The melting time of cylinders of same initial mass and surface but high (steel) and low (presses iron powder) thermal diffusivity is observed. Though the shell formed is thicker for steel the total melting time is longer for pressed powder cylinders (3) .

5 . Conclusion

The thermal diffusivity of sponge iron pellets and 'softened and molten' sinter and pellets is similare to that of pressed sponge iron powder.

References:
1) Kunii,D. et al.: AIChEJ 6 (1960) p.71/8
2) Friedrichs,H.A. et al.: Tetsu-to-Hagané 68 (1982),No 4, p. S-233
3) Rademacher,P.K.: Dr. rer. nat. thesis RWTH Aachen (1982)

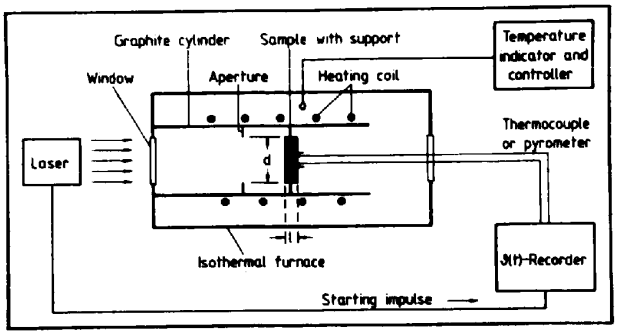

Fig.1: Measuring set-up for the laser-flash-method (3)

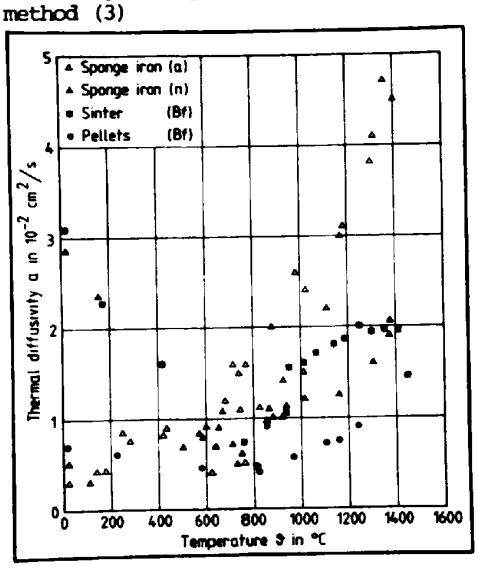

Fig.2: Thermal diffusivity of artifical (pressed powder) (3) and natural sponge iron and 'softened and molten' sinter and pellets (simulating blast furnace)

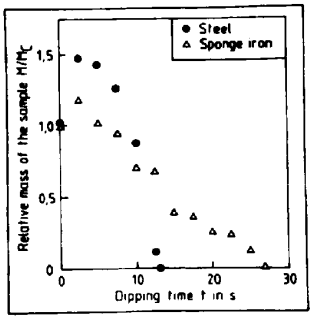

Fig.3: Relative mass M/M_C as a function of the dipping time t of cylinders with high (steel) and low (iron powder) thermal diffusivity (3)