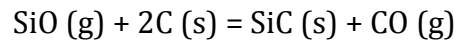


SiO reactivity test

General description of the SINTEF SiO test

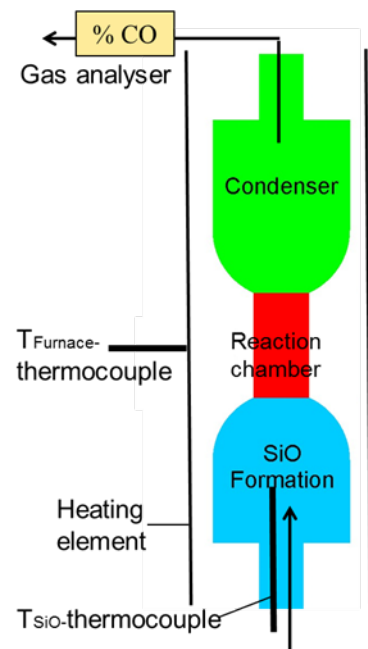
The SINTEF SiO-reactivity test is a unique method of characterising the “reactivity” of carbonaceous reactants towards SiO gas at elevated temperature (1650°C). The objective is to study the chemical reaction between solid carbon (C) in the test sample and hot SiO gas to form solid silicon carbide (SiC) according to the reaction:



The SINTEF SiO reactivity test is widely used by the silicon and ferrosilicon producers. The method simulates the above reaction that is occurring in the upper part of industrial submerged arc furnaces. Most of the SiO gas generated in the lower part of such furnaces is captured and reacts with carbon in the top charge to form silicon carbide, which is an important intermediate product in silicon and ferrosilicon production.

Equipment and method

The SINTEF SiO reactivity test is conducted within a vacuum graphite tube resistance furnace. Argon is used as an inert carrier gas and enters the bottom of the furnace where it passes through in-house made pellets, which produce the SiO gas together with some CO gas. This gas mixture passes the reaction chamber containing the carbonaceous test sample that reacts with the SiO gas to SiC and more CO gas. Nearly all the SiO gas will be converted to SiC in the beginning and only Argon with 18% CO will pass on to the condenser and the CO gas analyser. Gradually an increasing amount of SiO gas will pass unreacted through the test sample and decompose to SiO₂ and Si in the condenser where the gas cools down. The CO content of the exit-gas is continuously recorded and decreases as the reaction slows down. We stop the test at 5.2 % CO, which corresponds to the maximum obtainable conversion of C to SiC.



The SINTEF SiO reactivity is characterised by reactivity numbers (for instance R10, R10corr, R5.2) and the degree of conversion to SiC. A carbonaceous reactant with good SiO reactivity corresponds to low reactivity numbers and a high conversion to SiC. A low reactivity number means that a low amount of SiO gas has passed the sample without reacting. For Si and FeSi producers it is also essential that carbon react completely to SiC so the reacted sample should not contain un-reacted carbon.

The SINTEF SiO reactivity test is described in an article published in 2007 at the well-recognized international conference INFACON XI: "**SINTEF SiO-reactivity test**"

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