Chemistry in a blast furnace

A great many reactions, of different types, go on inside a blast furnace.

The hot air blast to the furnace burns the coke and generates a lot of heat (the reaction is highly exothermic):

$C + O_2 \longrightarrow CO_2$ **Oxidation**

The heat is sufficient to decompose the limestone, producing calcium oxide and more carbon dioxide:

$CaCO_3 \longrightarrow CaO + CO_2$ **Decomposition**

Since there are now high concentrations of carbon and carbon dioxide present, they will react together:

$CO_2 + C \longrightarrow 2CO$ **Redox**

The calcium oxide removes sulphur and other acidic impurities (such as silicon dioxide) from the iron ore:

$FeS + CaO \longrightarrow CaS + FeO$

$SiO_2 + CaO \longrightarrow CaSiO_3$ **Neutralisation**

The carbon monoxide *reduces* the iron ore to iron in a series of steps:

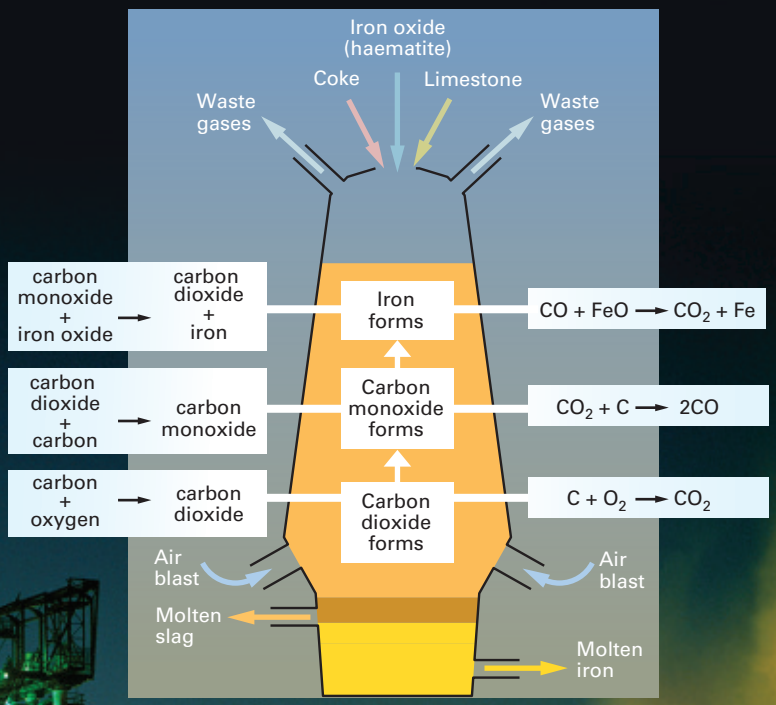
$3Fe_2O_3 + CO \longrightarrow CO_2 + 2Fe_3O_4$ **Redox**

$Fe_3O_4 + CO \longrightarrow CO_2 + 3FeO$ **Redox**

$FeO + CO \longrightarrow CO_2 + Fe$ **Redox**

The overall equation in a blast furnace is:

$Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$



Redcar steelworks at night

Martin Bond/SPL