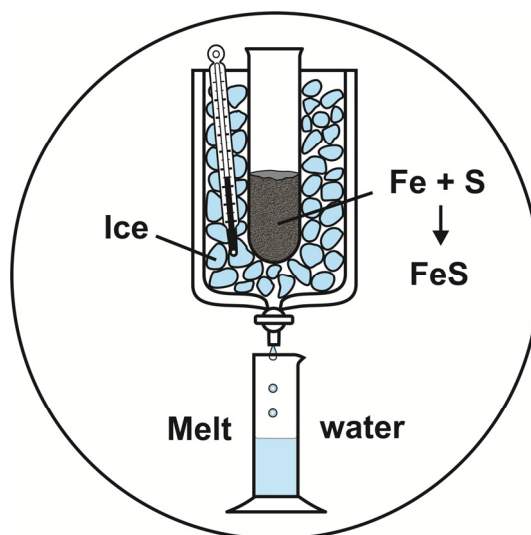


Ice Calorimeter

Equipment:

double-walled calorimetric vessel
large test tube
graduated cylinder calibrated in the unit of
entropy (0.82 mL of melt water corresponds
to an entropy of 1 J/K)
thermometer
mortar and pestle
sparkler
ring stand with clamp



Chemicals:

iron powder
sulfur powder
crushed ice

Safety:

sulfur powder (S):



H315
P302+352

iron sulfide (FeS):



H400
P273

Because of the generation of sulfur containing fumes during the reaction it is obligatory to work in a fume hood. It is also required to wear safety glasses and protective gloves.

Procedure:

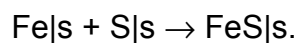
Iron powder and sulfur powder are cautiously mixed in a mortar at a the molar ratio of 1:1. 22.0 g of the mixture (which corresponds to 1/4 mol FeS) are put into the test tube. Subsequently, the test tube and the thermometer (in the case of an electronic thermometer its temperature sensor) are placed in the calorimetric vessel filled with crushed ice. Before the reaction is started the stopcock of the vessel is opened to remove the water, which was produced in the meantime. Then, the stopcock is closed, the reaction of the Fe-S mixture is initiated with the help of a sparkler and the stopcock is opened again. The melt water produced during the reaction is collected in the graduated cylinder.

Observation:

The mixture reacts thereby glowing red. Additionally, sulfur containing fumes are generated. Part of the ice melts. The temperature in the calorimeter remains (almost) constant.

Explanation:

Iron reacts with sulfur to iron sulfide:



During the reaction a considerable amount of entropy is released. The volume of water collected in the graduated cylinder is indicative of this amount of entropy (0.82 mL of melt water corresponds to the unit of entropy, i.e. 1 J/K).

Disposal:

The iron sulfide residue is collected in a special container for inorganic solids, which is subsequently sent for proper disposal.