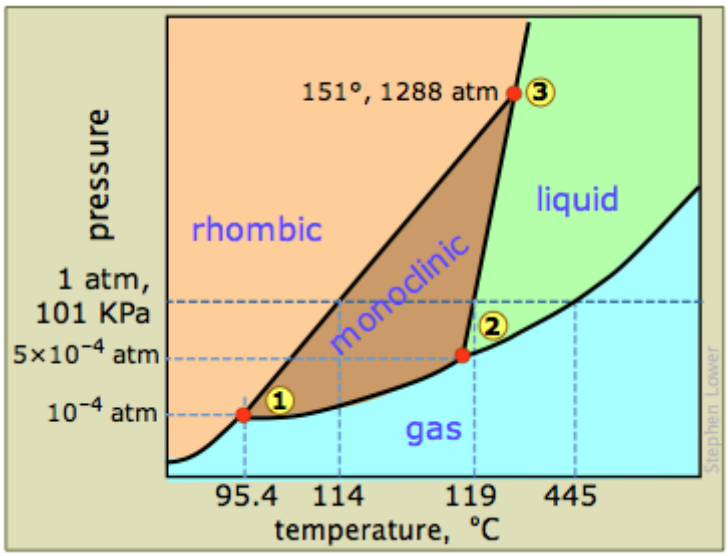
Answer to Question #61506, Chemistry / Other

Explain the phase diagram of sulfur.

Answer:



The diagram is complicated by the fact that sulfur can exist in two crystalline forms: rhombic and monoclinic.

Let's look first at the four areas:

Pink — only rhombic sulfur

Brown — only monoclinic sulfur

Green — only liquid sulfur

Blue — gaseous sulfur

The corresponding curves are:

lower left to ① — the sublimation curve of rhombic S:

S(rhombic)→S(g)

① to② — the sublimation curve of monoclinic S:

S(monoclinic)→S(g)

② to upper right — the vapour pressure curve of liquid S:

S(l)→S(g)

① to ③ — the transition curve for S(rhombic)→S(monoclinic)

② to ③ — the melting point curve for S(monoclinic) → S(l)

③ to top — the melting point curve for S(rhombic) → S(l)

There are three triple points:

① (95.4 °C, 1×10^{-4} atm) — rhombic S is in equilibrium with monoclinic S, and both have the same vapour pressure.

② (119 °C, 5×10^{-4} atm) — monoclinic S melts; this is the triple point for S(m)→S(l)→S(g).

③ (151 °C, 1288 atm) — rhombic, monoclinic, and liquid S are at equilibrium.

The critical point — where liquid and gaseous S have the same density — is off to the right at 1041 °C and 203.3 atm.

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