Problem 9-54

Consider 2.5 kg of austenite containing 0.65% carbon. It is equilibrium cooled below the eutectoid temperature.

(a) What is the proeutectoid phase?

Ferrite, i.e. $\alpha$.

(b) How many kilograms of each of total ferrite and cementite form?

To do this, simply use the lever rule just below 727°C.

$$W_\alpha = \frac{(6.70 - 0.65)}{(6.70 - 0.022)} \times 100\% = 90.6\%$$

The amount of ferrite in total is 0.906 times 2.5 or 2.27 kg. Consequently, the amount of cementite will be 2.50-2.27=0.23 kg.

(c) How many kg each of pearlite and proeutectoid ferrite form?

To answer this find the relative amount of austenite at just above 727°C. To do this, use the lever rule.

$$W_\gamma = \frac{0.65 - 0.022}{0.77 - 0.22} = 0.84$$

Then this changes to pearlite. We have 0.84 times 2.5 kg = 2.1 kg pearlite. The remainder of the material is 0.4 kg and it’s proeutectoid ferrite.

(d) Schematically sketch the microstructure.
Proeutectoid ferrite

Pearlite