

12. Selection of suitable materials

12.1 General

The sizing and specifying of control valves presupposes a high degree of experience in order to meet the requirements in an optimum manner. This applies particularly to the selection of the correct materials for the valve body, valve bonnet and internal parts (trim). A “low cost” control valve, composed of unsuitable materials soon becomes very expensive if it has to be replaced after only a short working life. On the other hand a valve consisting of expensive, exotic materials does not automatically ensure long durability if other important influential parameters have been disregarded. A selection of suitable materials is by no means made easy by the wide spread offering of valve manufacturers. One is reminded of pharmacies who also offer prescriptions identical or at least very similar under different names. As a kind of introduction, a systematic survey of common control valve materials should be examined in order to provide an orientation for valve designers and users (Figure 12.1.-1).

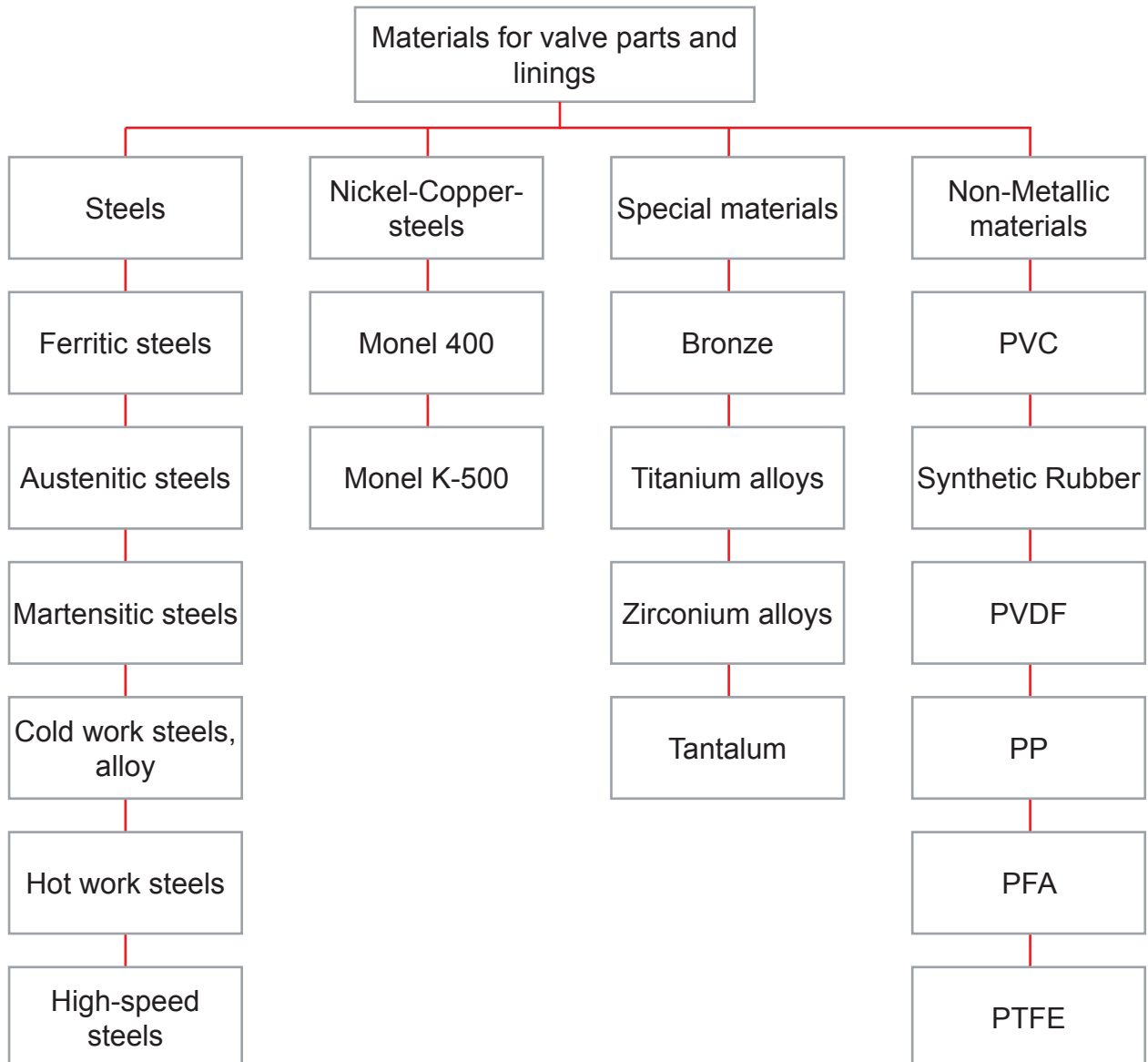


Figure 12.1.-1: Commonly used materials for control valves

The survey in Figure 12.1.-1 does not claim completeness but simply highlights the most important categories from the great number of available materials. The selection of a suitable material is basically an extremely complex topic so that at this point only three relevant aspects will be considered. These naturally play an important role in the material selection procedure for control valves:

- Corrosion resistance,
- Resistance against wear (e.g. erosion),
- Strength and/or fatigue strength of material.

Iron-carbon phase diagram

The percentage of carbon present and the temperature define the phase of the iron carbon alloy and therefore its physical characteristics and mechanical properties.

The percentage of carbon determines the type of the ferrous alloy: iron, steel or cast iron. Carbon content 6.67% Figure 12.1.-2 corresponds to the fixed composition of the iron carbide Fe_3C .

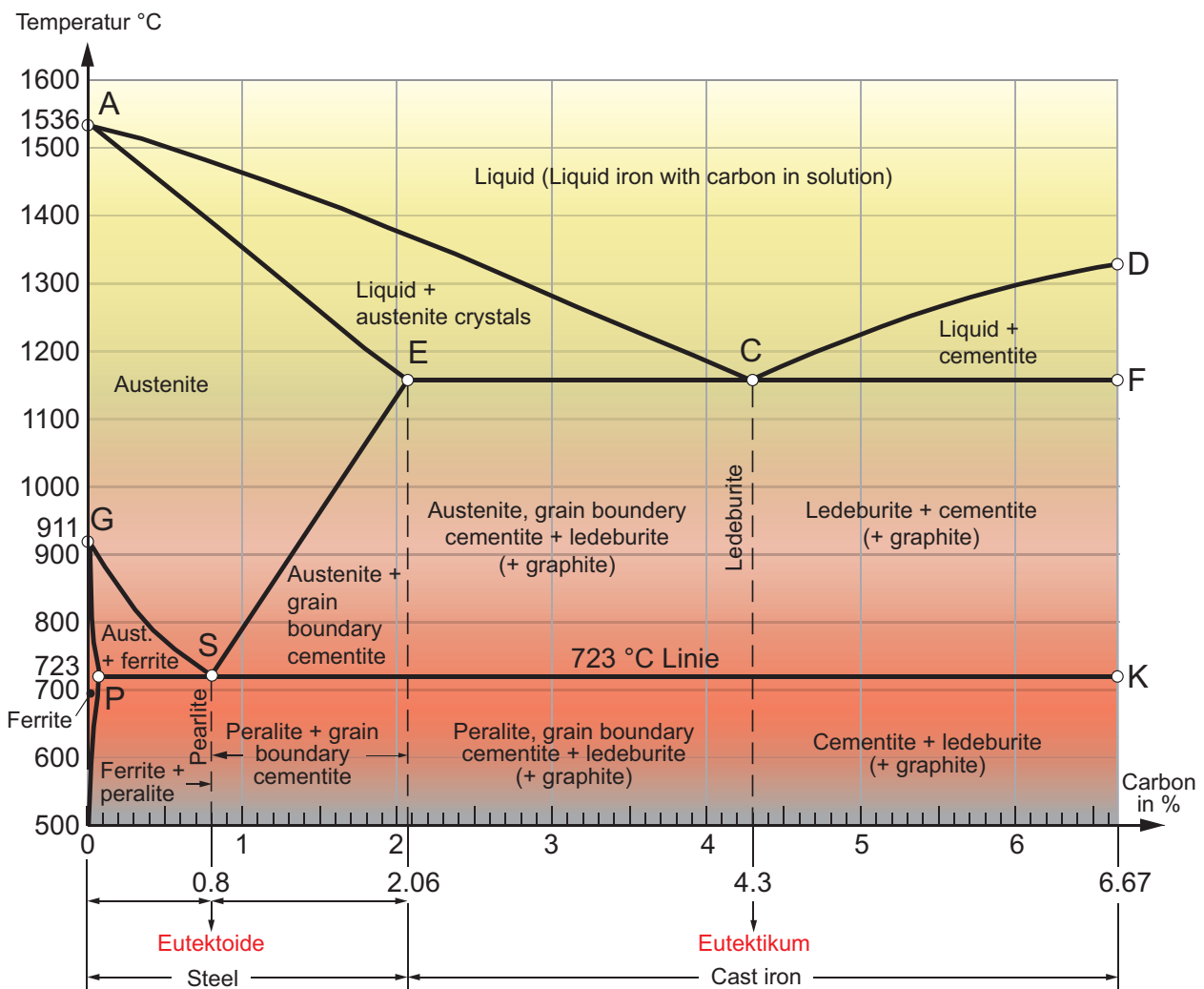


Figure 12.1.-2: The iron-iron carbide ($\text{Fe}-\text{Fe}_3\text{C}$) phase diagram