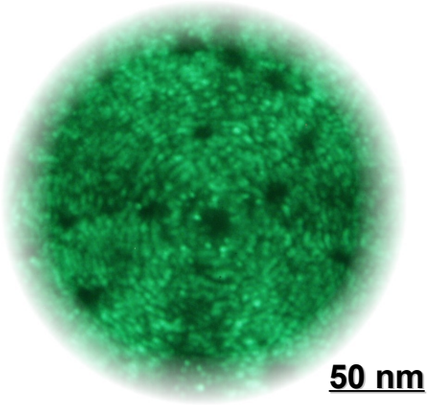
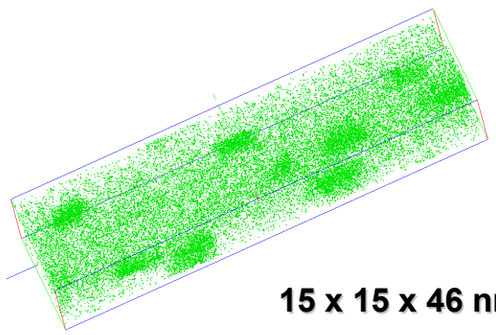
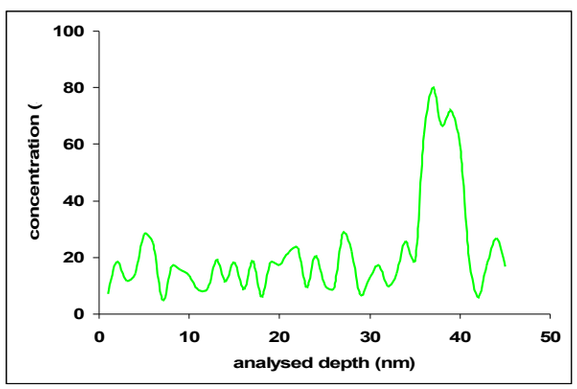
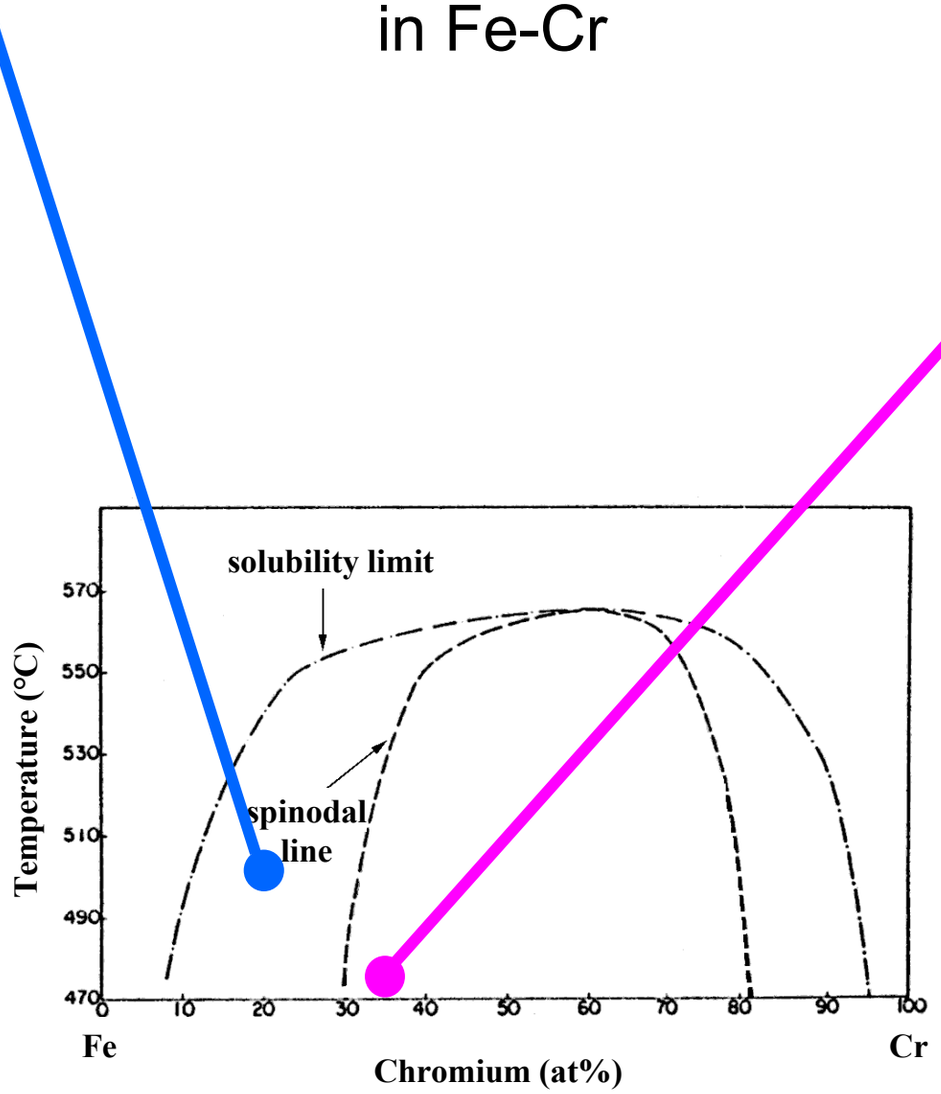
Nucleation & Growth



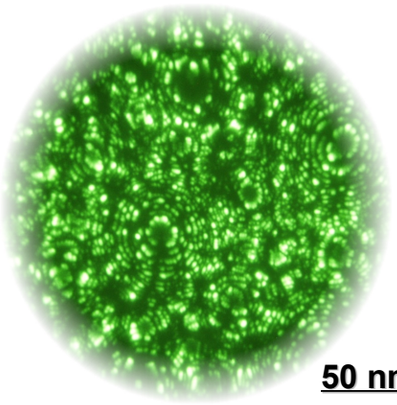


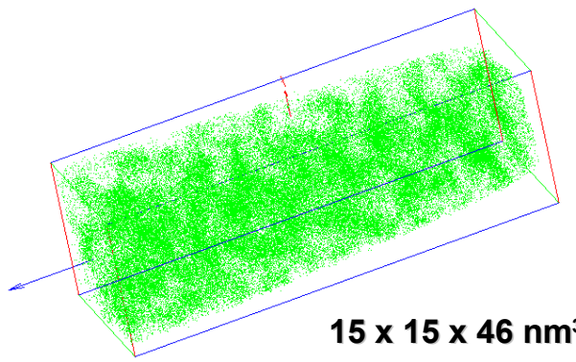


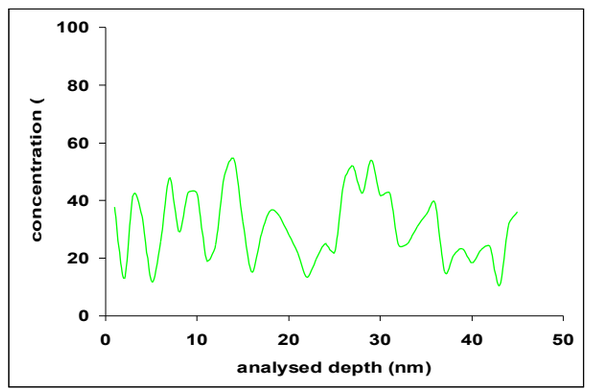
Miscibility gap
in Fe-Cr



Spinodal Decomposition







The binary Fe-Cr system is the basis of all stainless steels.

In order to understand the properties of stainless steels, it is essential to understand the phase transitions occurring in the binary Fe-Cr system, among which the mechanism known as ‘475°C embrittlement’.

Field ion microscopy and atom probe microanalysis, because of their ability to identify the phases formed during ageing, give access to the microstructure of these materials, down to the atomic scale.

They give the possibility to investigate the time evolution of the microstructure, and to clearly identify the two possible modes of phase separation, i.e. nucleation and growth on one side, and spinodal decomposition on the other.

In the first case, small nanometre scale Cr rich precipitates form and develop. In the second, a double interconnected network of Cr rich and Fe rich regions develops, spatially and in term of concentration variation amplitude.

These two modes are the two possible paths to reach equilibrium, constituted of large Cr rich and Fe rich domains.