440 21-Crystallography at Non-Ambient Temperatures and/or Pressures; Phase Transitions

The γ-solid solutions in some steels are unstable during ageing. This instability is connected with partial excretion of the carbon from solid solution and, as a result, austenite lattice parameters are seen to decrease in some temperature ranges. Formation of the new phases, physical and mechanical properties are due to change in carbon content in austenite thermal instability range.

Fe-12,0wt%Mn-1,1wt%C and Fe-11,1wt%Mn-1,1wt%N alloys with many crystal structures have been selected for investigation. The austenite thermal instability range is determined during step heating by X-ray powder diffraction. In the carbon-containing alloy, the thermal instability occurs in the temperature range 300-600°C and at 400-800°C for the nitrogen-containing one. This difference is connected with differences in the mobility of carbon and nitrogen. In the thermal instability range, the precipitation of carbide and nitride is found by qualitative analysis. The quantity of carbon (nitrogen) at maximum temperature instability is evaluated. The results of investigations show that only some part of the carbon or nitrogen in the alloy formed the carbide or nitride. Probably, the remainder of carbon (nitrogen) precipitates as atoms in the structure defects. After heating, defects induce a high pressure which forces carbon and nitrogen in octa- and tetrapores of the bcc lattice of austenite. Increase of lattice parameters in γ-solid solution confirms this assumption at temperature conditions where the solubility of carbide or nitride is hardly possible.

Thus the greater stability of the nitrogen-containing γ-solid solution over the carbon-containing γ-solid solution is related to the different mobilities of carbon and nitrogen. Part of carbon or nitrogen precipitated forms carbide or nitride, and the remainder is concentrated in defects in atomic state.

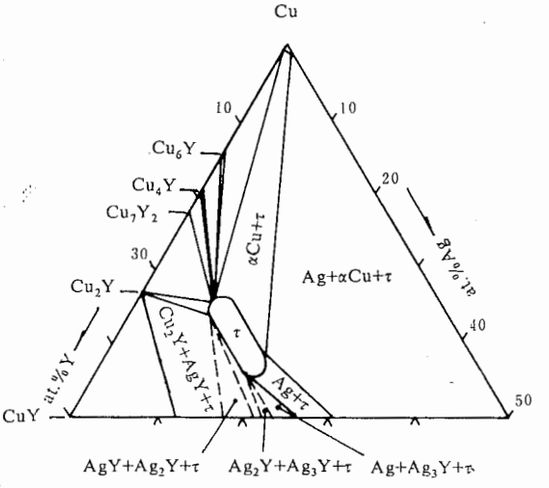
PS-21.03.25 STUDY ON THE SELF-PHASE-TRANSITION CHARACTERESTIC OF ULTRAFINE PARTICLES. By LIU Cunye *, DENG Zhaojiang, REN Hongxiang and Li Jian, Department of Physics Southwest China Teachers University, Chongqing, Sichuan CHina , 630715

The study of the atomic structure has been extended to ultrafine pritcle (UFP) containing hundreds and millions of atoms, the macroscopic concepts of surface energy and chemical potential is applied to investigate the surface structure of UFP, the growth process of UFP is described by using the equation of macroscopic theory to be revised.

By experiment and theoretical research, we find that UFP possesses one kind of the characturestic of the s elf-phase-transition(SPT), namaly, UFP has a trend of the spontaneous phase transition, it is name 'SPT effect' in this paper. The SPT process of UFP does not need that rigorous surroundings condition, which is necessary for the phase transition process of macroscopic matter (such as sur roundings temperature, pressure, surroundings atomsphere, etc.). The SPT process of UFP depend on own microstrecture, praticle size, morphology, etc. The time-dependence of the SPT process submits to a power-law. We have done a preliminary research for the SPT mechanism of metal and metal oxide UFP.

PS-21.03.26 THE ISOTHERMAL SECTION OF THE PHASE DIAGRAM OF Ag-Cu-Y TERNARY SYSTEM AT 500℃. By D.X.Li, L.M.Zeng * and Y.H.Zhuang, Department of Physics, Guangxi University, Nanning 530004, China.

The isothermal section of the phase diagram of Ag-Cu-Y ternary system (Cu ≥ 50at.%) at 500℃ has been investigated by X-ray diffraction. The section consists of seven single-phase regions: α-Cu, Cu_6Y, Cu_4Y, Cu_7Y_2, Cu_2Y, CuY and $Ag_3Cu_{12}Y_5$(τPhase); sixteen two-phase regions: Ag+αCu, αCu+τ, Cu_6Y+τ, Cu_4Y+τ, Cu_7Y_2+τ, Cu_2Y+τ, Cu_2Y+AgY, AgY+τ, Ag_2Y+τ, Ag_3Y+τ, Ag+τ, αCu+Cu_6Y, Cu_6Y+Cu_4Y, Cu_4Y+Cu_7Y_2, Cu_7Y_2+Cu_2Y and Cu_2Y+CuY and ten three-phase regions: Ag+αCu+τ, αCu+Cu_6Y+τ, Cu_6Y+Cu_4Y+τ, Cu_4Y+ Cu_7Y_2+τ, Cu_7Y_2+Cu_2Y+τ, Cu_2Y+CuY+AgY, Cu_2Y+AgY+τ, AgY+Ag_2Y+τ, Ag_2Y+Ag_3Y+τ and Ag+Ag_3Y+τ. A new ternary compound (τ phase) has been found. The compound, which is $Ag_3Cu_{12}Y_5$, has a limited solid solubility. The composition range is 23-27at.%Y, 9-19at.%Ag. τphase has a cubic structure of β-Mn (A13) type with a = 7.127(4) Å at 25℃. The maximum solid solubility of silver and yttrium in α-Cu at 500℃ is 0.8at.% and 1.5at.% respectively.



PS-21.03.27 THE CHANGE OF THE PHASE COMPOSITION OF THE NATURAL URANIUM OXIDE BY HEATING. L.V.Zvezdinskaya[1]*, V.N. Shtanov[2], A.V.Timofeyev[1]. [1]Institute of the geology of the ore deposits, petrography, mineralogy and geochemistry, Russian Academy of Sciences, Moscow, Russia; [2]Moscow State University, Moscow, Russia.

The changes of the morphology and phase composition of the pitchblende by the heating from 25° to 900°C were analysed by the thermomicroscopy and X-ray diffraction (the heating rate 10° C/min). For the investigation the cubic pitchblende (a_o = 5,452 ± 0,018 A) from one of the uranium deposits (North Kazakhstan) was picked out. The surface of the mineral heated to 300°C does not change; the parameter a_o being practically constant. In the range of 390 - 700°C the pitchblende is oxidized; this process is accompanied by the fissure formation. It proceeds most intensivly at 465 - 510°C and probably is connected with the partial polymorph conversion of the former formed rhombic U_3O_8 into the hexagonal modification. From 765°C the sample surface is warped, the fracture size being increased. At 800°C the pitchblende spherolites are decrepitated into the smaller ones. In the range of 885 - 905°C the mineral surface slowly raises over the metall container bottom

