07.X-01 MATERIALS WITH VALENCE INSTABILITIES.

E. Kaldis, Laboratorium für Festkörperphysik, ETHZ, 8093 Zurich, Switzerland

Materials with valence instabilities are small gap semiconductors (e.g. SmS, SmS\textsubscript{2}) or metals (e.g. TmSe, CeN) which under pressure may change the valence state of their cation. Although this phase transition is followed by a large volume contraction (approx. 10\%), no change of the structure (NaCl) takes place. The change of valence can be achieved in TmSe also by variation of nonstoichiometry (E. Kaldis et al. J. Phys. 40 (1979) C5-366) or mixed crystal formation like TmSe\textsubscript{1-x}Eu\textsubscript{x}, Tm\textsubscript{1-x}Eu\textsubscript{x}Se (E. Kaldis, B. Fritzler, J. Phys. 41 (1980) C5-135). Both of these parameters lead to changes of the crystal field splitting of the 5d-band and therefore vary the degree of overlapping of the 5d-band with the 4f localized level.

Solution calorimetry (TmSe, SmS\textsubscript{2}) and T-X phase diagram studies (TmSe, SmSe\textsubscript{1-x}Eu\textsubscript{x}, SmS\textsubscript{2}) indicate that valence instabilities introduce phase instabilities. The thermodynamically unstable phases show, however, appreciable metastability. Calorimetric measurements in CeN show that alloying with less than 1\% at. oxygen increases the stability (decrease of the heat of solution) of the valence state of CeN by the oxygen doping.

07.X-02 FINE METAL CRYSTALLITES: MORPHOLOGY AND STRUCTURE

By Ryozi Uyeda
Department of Physics, Meijo University
Tempaku-ku, Nagoya, Japan

Fine metal crystallites of diameter less than 1\,\mu m can be produced by the evaporation and subsequent condensation of a metal in an atmosphere of inactive gas. A study of these crystallites by electron microscopy and electron diffraction was initiated in 1962 by the present author and pursued in Nagoya University and Meijo University. Up to the present most of the ordinary metals and semi-metals (30 elements) have been studied [1,2].

Some of the important results are as follows:

Metal crystallites produced by the condensation in the gas look like a smoke. Those of crystallographic interest are produced at gas pressures between 10 - 100 Torr. A typical smoke has a shape like a candle flame, consisting of inner, intermediate and outer zones.

The mechanism of crystal growth in a smoke:\textsubscript{IS} studied. A remarkable result is that the crystallites grow not only by condensation of vapour, but also by collision and subsequent coalescence of crystallites.

07.X-03 MECHANISMS OF EPITAXY.

By R. Kern, C.R.H.C. - C.N.R.S., Campus de Luminy, case 913 - 13288 MARSEILLE CEDEX 9, FRANCE.

The understanding of epitaxy has received a great impulse by extensive use of such phase methods. The methods are briefly considered and their practical power analysed. In-situ methods have received special attention in recent years and very original results have been obtained. Ellipsometry is such a method which is able to give simultaneously information about thickness and composition inside an industrial epitaxy reactor. Some typical examples will be given on systems as metal - insulator, metal - semiconductor, semiconductor - semiconductor.