In a similar study on the growth of A15 materials in multilayer films a new Sn-rich phase with a phase transition was observed in the initial stage of the interface reaction.

For another practical application, gold contact metallization on InGaAsP layers was studied (J. M. Vandenberg et al, J. Appl. Phys. (1982) 53, 7385). A well-defined sequence of Au-In alloys with increasing In content was identified; as the composition changes from the binary InP to the ternary InGaAs the reaction temperatures of the alloys decrease. These observations could be explained in terms of the thermodynamics of solid state reactions and related to previously observed variations in contact resistance.

The moving X-ray film cassette can be exchanged with a Huber counter tube attachment; scans and data acquisition are computer controlled. In this mode the initial growth kinetics of the Cu-Al thin-film system were studied. The rate of reaction of $CuAl_2$, the first phase growing in the interface, was monitored via changes of integrated intensities. Similar studies were done using in-situ annealing Rutherford backscattering analysis. Good agreement was obtained between growth parameters of $CuAl_2$ determined for each technique. The X-ray technique appears to be the more advantageous method to simultaneously study the growth of more than one phase, since it allows exact phase identification and therefore each phase can be monitored individually. In the case of the Cu-Al system the in-situ X-ray scans indicated the growth of Cu_9Al_4 together with $CuAl_2$ and the growth parameters of Cu_9Al_4 could now for the first time be determined. These results indicated that in-situ annealing X-ray diffraction can be a valuable tool to study phase formation and growth kinetics of individual phases in thin-film interfaces.

07.2–18 IN SITU OBSERVATION OF TANTALUM THIN FILM OXIDATION.

By S. Lugomer, M. Kerenović and M. Stipančić, Electronical Faculty, Banja Luka, Yugoslavia.

Comparative study of isothermal (T=700K) and nonisothermal (T increased from 300K to 700K) thin Ta film oxidation in air, by in situ reflectivity and electrical resistivity measurements, has been performed.

Amorphous, very porous structure, consisting of Ta_2O_5, TaO and TaOx (x<1) solid mixture, was found.

An anomalous electrical resistivity peak was found in the incubation period.
Nonisothermal oxidation kinetics curve $d=f(\tau)$ |τ=time, d=oxide thickness|, fit very well the interrupted kinetics; incubation period-to the temperature dependent Koofstad's equation:

$$d \simeq \frac{RT}{Q} \ln (\tau+\tau_o)+C,$$

and period of extended oxidation - to the simple logarithmic equation:

$$d = 49 \log(\tau-46)+5.$$

Isothermal oxidation kinetics curve fit excellently the uninterrupted parabolic equation.

$$d = 21(\tau - 9)^{1/2} - 19.$$

|τ in minutes, d in nm|.

07.2–19 INFLUENCE OF CORRELATION AND ANISOTROPY ON THE CRYSTAL FACE MOLECULAR ROUGHNESS.

BY Z.Matysina, A.Ovrutski, L.Chuprina, M.Milyan. Dniepropetrovsk State University, 320000 Dniepropetrovsk, USSR.

The molecular roughness on the crystal surface bonding with melt has been investigated by the quasichemical method with taking into account the correlation of reciprocal atom situations and anisotropy of atomic interaction. The dependences of the interfacial free energy on concentration of condensed "solid" atoms were determined for different temperatures and interaction energies of atom pairs V_{ss}, v_{ss}, V_{sl}, V_{ll} (s- "solid", l - "liquid", V_{ss} and v_{ss} are the energies of strong and weak s-s bonds). Both correlation and anisotropy reduce the free energy, the minimum of surface free energy becomes more deep for roughness surface. Temperature dependences of the face roughness (the energy of the surface relative to the energy of smooth face) were calculated and they were compared with the known results of other models. The coincidence of theory with the experimental data for Bi was received for $v_{ss}=0.9\ V_{ss}$ if $V_{sl} \leq 0.97 V_{ll}$. The model with limitations on the "solid" atoms surrounding was studied also.

07.2–20 ФАЗООБРАЗОВАНИЕ В ТОНКИХ ПЛЕНКАХ Tl - S.

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Рассмотрены вопросы взаимодействия и фазообразования в системе Tl - S при вариации условий вакуумного осаждения компонентов. Проведен электронографический анализ образующегося конденсата. При одновременном осаждении Tl и S на свежие сколы NaCl, на которые предварительно был осажден углерод толщиной ~50Å, образуются 5 различных сульфидов таллия: 4 из них в аморфном состоянии и I в поликристаллическом. Кристаллизация аморфных пленок показала наличие соединений: Tl_2S, Tl_4S_3, TlS и Tl_2S_5, а кристаллическая фаза отнесена к составу Tl_8S_{17} (Васильев и др., Известия АН СССР, серия Неорганические материалы (I973) 9, №4, 553). Все фазы, кроме Tl_2S, текстурированы, ось текстуры - ось "c". Косые текстуры от Tl_8S_{17} позволили однозначно определить период кубической решетки a = I0.60Å, пространственная группа характеризуется отсутствием погасаний. При последовательном осаждении компонентов (Tl на S и наоборот) на плоскости конденсации образуются лишь две аморфные фазы: Tl_4S_3 и TlS. Термообработка поверхности конденсации при T≈I50°C в течение ~ 20 минут приводит к кристаллизации аморфных пленок, при этом помимо указанных двух фаз выявляется еще и фаза Tl_2S.