

MM 28: Intermetallic Phases I

Time: Wednesday 17:30–18:15

Location: H 0107

MM 28.1 Wed 17:30 H 0107

Investigation of lead free soldering reaction between solid Ni and liquid Sn — ●JENS GÖRLICH and GUIDO SCHMITZ — Institut für Materialphysik, Wilhelm-Klemm-Str.10, D-48149 Münster, Germany

After the ban of lead it is important to understand the reaction mechanisms of new lead free solder systems. We investigated the inter-reaction between solid Ni and liquid Sn. Reaction times were from 10 seconds to 14 days at 250°. By scanning electron microscopy we obtained the particle size distributions and determined grain growth of the Ni₃Sn₄ phase with time. With focused ion beam preparation, we could study the properties of the intermetallic connection layer at the interface Ni/Sn by transmission electron microscopy (TEM) in detail. At short times, the growth rate agrees with the flux driven ripening theory for soldering [1] [2], but for longer times, the time exponent deviates significantly. TEM analysis reveals that the general assumption of constant interface area is not fulfilled at any time. We will compare the experimental data with existing soldering models and present an approach for the growth kinetics of Ni₃Sn₄ in the Ni/Sn system. (supported by DFG)

[1] K.N. Tu et. al., Physical Review B 66, 115403 (2002)

[2] G. Gosh, J. Appl. Phys. Volume 88, Nr. 11 p.6887

MM 28.2 Wed 17:45 H 0107

Fabrication of CoTiSb and NbNiSb Half-Heusler phases for thermoelectric applications — **NOTE: This talk has been withdrawn** — ●WILFRIED WUNDERLICH, YOSHIKAJI AOKI, KOUSUKE NAKATSUKA, HIDETO UENO, and YUICHIRO MOTOYAMA — Tokai University, Fac. Eng, Materials Science Dept., Hiratsuka-shi, Kanagawa, Japan

Important applications of Half-Heusler phases are as thermoelectric

materials. For the cases of CoTiSb, TiNiSn and others, ab-initio simulation using VASP-software could confirm the phase stability against phases with concurrent crystal structures like TiNiSn, ZrCoAl, ZrBeSi, FeSiV and Full Heusler. However, the thermo dynamical driving force for formation as calculated from the difference in lattice energies is less than 0.1eV/atom. Hence, the fabrication of Half heusler phases is difficult and requires three steps, surface activation of the raw material by ball milling, arc-melting of pressed pellets and finally long-term annealing treatment. For the CoTiSb system, diffusion couple experiments clarified the complicated diffusion mechanism, which can lead in worst cases to Kirkendahl voids and constitutional vacancies. On doped CoTiSb specimens, Seebeck coefficients up to 0.1 mV/K, on NiNbSb 0.3 mV/K were measured.

MM 28.3 Wed 18:00 H 0107

Influence of microstructure on magnetostriction properties of FePd thin films — **NOTE: This talk has been withdrawn** — ●WILFRIED WUNDERLICH, KEISUKE TAKAHASHI, DALJI KUBO, YOSHITO MATSUMURA, and YOSHITAKE NISHI — Tokai University, Fac. Eng, Materials Science Dept., Hiratsuka-shi, Kanagawa, Japan

FePd-alloys as thin films are potential actuators materials due to their magnetostriction. Experiments and simulations of TEM and XRD diffraction patterns showed, that the L1₀-ordering has no influence on the lattice parameter ratio c/a=1.37. The degree of long-range order is higher for the sputtering temperature of 573K than of 423K, but the magnetostriction is higher for thin films produced at 423K. The model for explanation is contrary to the usual behavior, where ordering increases the magnetic susceptibility; for achieving a large magnetostriction an initial degree of disorder is more favorable.