

Plasticity of α -brass Single Crystals at Low Temperatures(Metalurgy)

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journal or publication title	Science reports of the Research Institutes, Tohoku University. Ser. A, Physics, chemistry and metallurgy
volume	26
page range	370-371
year	1976
URL	http://hdl.handle.net/10097/27933

specimens, while no new peak is observed in gold doped ones. Detailed investigations are carried out on the behavior of the peak P_b , which is interpreted to be due to thermal unpinning of dislocations from pinning silver atoms. The behavior of the other peaks is also described.

Internal Friction Peaks of Cold-Worked Dilute Copper-Aluminium Alloys

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Philos. Mag., **32** (1975), 441.

The internal friction of cold-worked Cu-Al alloys is measured with an inverted torsion pendulum in the temperature range between -180°C and $+100^{\circ}\text{C}$. Among 10 specimens with different contents of aluminium ranging from 0.01 to 2 at.%, distinct peaks are observed for the two compositions, 0.13 and 0.18 at.%Al, the peak height being larger for the former; detailed studies are made on 0.13 at.%Al specimens.

The peak is introduced by plastic deformation and disappears on annealing at temperatures around $+150^{\circ}\text{C}$. For a specimen annealed in an oxidizing atmosphere prior to the final deformation, the peak is no longer observed. The peak is considered to be a combined effect of dislocations and aluminium atom-vacancy complexes.

Defect Structures and Long-Range-Order Parameters in Off-Stoichiometric Ni_3Al

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Phys. Status Solidi a, **32** (1975), 657.

The deviation of the composition from stoichiometry in the Ll_2 -type intermetallic compound Ni_3Al has been systematically investigated in relation to the change in lattice parameter, density, and long-range-order parameter, S . Special attention is paid for such crystallographic features as the kind of defect structure and the atom sites in off-stoichiometric composition. It is concluded that substitution occurs and maximum order retains at both side of stoichiometry. Therefore it is obvious that at the Ni-rich side all Al atoms occupy cube corner sites and the Ni atoms occupy all face centre sites and vacant cube corner sites of the unit cell, while at the Al-rich side all Ni atoms occupy face centre sites and the Al atoms occupy all cube corner sites and vacant face centre sites of the unit cell.

Plasticity of β -brass Single Crystals at Low Temperatures

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Trans. Japan Inst. Met., **16** (1975), 453.

The plasticity of β -brass single crystals, whose tensile axes lie relatively near the

[001] direction, was investigated at temperatures ranging from 77°K to room temperature. It was found that the flow stress at 0.2% strain did not continuously increase with decreasing temperature but showed a peak value at about 195°K. The behavior is different from the temperature dependence of flow stress in ordinary *bcc* metals and alloys. The slip systems determined from the observation of surface traces are the {112}⟨111⟩ at 77°K and the {110}⟨111⟩ at room temperature. However, at the intermediate temperatures where the flow stress showed a peak value, two sets of slip traces or the slip plane between the basic {112} and {110} planes were observed depending on deformation temperatures. Therefore, the increase in flow stress at the intermediate temperatures is interpreted as an interaction between different slip systems or an occurrence of cross slip from the {110} or {112} basic slip plane.

Below 115°K, the temperature dependence and the strain rate sensitivity of the flow stress are similar to those of ordinary *bcc* metals and alloys.

Deformation of Age-hardenable Al-3%Cu Non-isoaxial Bicrystals

Osamu IZUMI and Takayuki TAKASUGI

Trans. Japan Inst. Met., **16** (1975), 397.

Tensile tests were performed on bicrystals and corresponding component crystals of Al-3%Cu heat-treated to different stages of ageing, that is, those of supersaturation, intermediate phase formation and stable phase precipitation. The stress-strain curves were analysed from the point of view of the effect of ageing and crystal orientation on deformation. The following results were obtained: (1) The strength of a supersaturated solid solution is determined by the compatibility condition and the dislocation pile-up mechanism at a grain boundary. (2) No simple relationship was established for both intermediate phase formation and stable phase precipitation. (3) The "grain boundary strength" $\Delta\sigma_e$, of the supersaturated solid solution shows a parabolic relation against strain. (4) The "grain boundary strength" for the intermediate phase initially shows a parabolic strain dependence, but decreases to a negative value as deformation proceeds. (5) The "grain boundary strength" for the stable precipitation shows a parabolic strain dependence similar to that at the supersaturation stage.

Surface Strengthening in Aluminium Single Crystals Coated with Electro-Deposited Nickel Film

Takayuki TAKASUGI and Osamu IZUMI

Acta Metall., **23** (1975), 1111.

The effect of surface coatings with electro-deposited Ni-film on the strength of aluminium single crystals was studied at room and liquid nitrogen temperatures. The mechanism of surface strengthening seems to consist of the long- and the short-range interaction stress components. The former is dependent on strain and