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Production of Ferrosilicon for Nodularizer by Silicothermic Reaction(Metallurgy)

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journal or publication title	Science reports of the Research Institutes, Tohoku University. Ser. A, Physics, chemistry and metallurgy
volume	27
page range	91-92
year	1979
URL	http://hdl.handle.net/10097/28060

particles precipitated in a copper matrix. But the relationship between the superconducting properties and the microstructures of this alloy has not been well established. The purpose of the present study is to clarify the nature of the superconductivity observed in the splat-quenched dilute copper alloys such as Cu-Nb, Cu-Nb-Sn and Cu-V-Ga systems.

These alloys were prepared by arc melting and splat-quenching from the liquid state at a rate of about 10^5°C/sec. The tape-shaped specimens sealed in quartz tubes under vacuum, were heat-treated at various temperatures. Experiments were performed on the determination of transition temperature (Tc) and critical current density (Jc) as well as on the observation of microstructures by the transmission electron microscope.

All specimens as splat-quenched were not superconducting above 4.2 K. However, the superconductivity was recognized after precipitation of dispersed Nb, Nb_3Sn or V_3Ga particles in respective alloys. The superconducting properties were closely depended on the nature, size and distribution of these particles.

In a Cu-0.4at%Nb alloy system, the highest Tc obtained after annealed at 800°C was 5.8~7 K, and the highest Jc was 90A/cm² at 4.2 K, corresponding to the Nb particles (average size 1000~2000 Å) to precipitate on grain boundaries. In a Cu-0.30 at%Nb-0.15at%Sn alloy, the highest Tc obtained after annealed at 550°C for 384 h was 8.7~12 K, and the highest Jc was 130A/cm² at 4.2 K. The microstructure of this specimen revealed that the fine particles of Nb_3Sn (average size 200~500 Å) dispersed in the Cu matrix and the interparticle distance was ~500Å. In a Cu–0.45at%V–0.19at%Ga system, the highest Tc obtained after annealed at 700°C for 96 h was 9.6~12.5 K, and the highest Jc was 525A/cm². The fine V_3Ga particles (average size 300~500 Å) were distributed uniformly in a Cu-matrix.

Based on the experimental results obtained, it is concluded that the proximity effect due to these superconducting particles strongly contributes to the observed superconductivity.

Production of Ferrosilicon for Nodularizer by Silicothermic Reaction

Takashi SATO and Tohei OTOTANI

Imono (J. Jap. Foundrymen's Soc.), **49** (1977), 653.

Silicothermic reduction method was applied to produce ferrosilicon which contains Mg and other alkali earth metals and which is a powerful nodularizer of graphite in cast iron. Ferrosilicon was melted in a high frequency induction furnace using a MgO-lined crucible and treated by fluxes of powdered MgO CaO, SrO, BaO or $CaCO_3$+$MgCO_3$.

Mg content of the ferrosilicon increased with the reaction temperature. Contents of other alkali earth metals were approximately in proportion to their boiling points. The nodularizing characteristics of the ferrosilicon were compared by examining the cast iron treated by them microscopically. The fading tendencies of nodularizing action were evaluated indirectly from the effect of the holding time

after inoculation on the chilling depth of gray cast iron treated by various ferrosilicon and calcium silicide. From the results of these tests, it was concluded that the ferrosilicon containing small amounts of Mg and Ca reduced from their oxides can be used as an effective nodularizer for cast iron.

Rolling Texture of Thin Copper Foil

Keisuke IKEDA and Eihachiro TANAKA

Shindo Gijutsu Kenkyukai Shi (J. Jap. Copper & Brass Res. Assoc.), **16** (1977), 121.

Textures of copper foils rolled from three initial thickness (0.25, 2.5 and 25 mm) to approximately 3 μm thick have been examined. Attention has been directed to the effects of foil thickness and rolling reduction, because it appeared that the thickness effect and the amount of deformation would lower the apparent fault energy. The intensity of the (220) reflection of copper rolled from a thickness of 25 mm decreased continuously at reductions from 90 to 99%, and then began to climb with additional deformation. On the other hand, the (220) reflection of nickel, which has the higher stacking fault energy than copper does, continued to decrease steadily up to a final thickness of 3 μm thick. A subsequent increase in intensity observed on copper appeared to be a result of a true textural change. A specimen rolled from 25 mm thick to 100 μm, of which the (200) intensity decreased to a minimum, showed feature typical of copper type texture. However, some noticeable changes in texture took place after further rolling. A general appearance of the (111) pole figure of copper rolled up to 3.5 μm was similar to that the brass type texture. The thinner the initial thickness, the smaller was the amount of deformation required to cause the texture transition. The brass-like texture appeared in heavily cold-rolled copper was different from a typical brass type texture in details. It can be noted that the intensities around the (111) [112] and (110)[001] orientations which are minor components in the brass type texture is extremely weak. The texture transition in copper was attend with the change in stacking fault probability in the same manner as other instances. However, the twin fault probability was practically zero within the experimental errors. All results obtained in this work indicated that the mechanical twinning or slip by partial dislocations is not the necessary condition for the texture transition to occur.

Effects of Distribution of Helium Bubbles on the Tensile Properties and Swelling of Neutron-Irradiated and Annealed Beryllium

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J. Nucl. Mater., **68** (1977), 82.

Tensile properties at 250°C and swelling of beryllium, irradiated to 5×10^{20} n/cm^2 at about 450°C and subsequently annealed for up to 1000 h at 800, 900 and 1000°C were measured to elucidate the effect of helium bubbles formed during the annealing. Size and distribution of the bubbles in the matrix, grain surfaces, and