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Compression Textures of Copper and Its Binary Alpha Solid Solution Alloys*

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Previous investigations have shown that the cold rolling textures^{1,2} and the drawn wire textures³ of copper change their secondary components after the addition of about 1 pct aluminum and 5 pct zinc, but do not change after the addition of as much as 30 pct nickel. However, few data are available on compression textures. Barrett⁴ reports from unpublished work with E. L. Layland that compression rolled copper develops a texture which is predominately {110} in the compression plane with a secondary spread to {113} and weaker spread to {100} as shown in Fig 1. However, 70-30 alpha brass similarly treated develops a texture again predominately {110} in the compression plane and with a weak secondary spread to {113} but with moderate {111} secondary intensities illustrated in Fig 2.

Experimental Procedure

Specimens of the compositions shown in Table 1 remaining from a previous investigation³ were annealed to a grain size of 0.090 mm average diam and machined to cylinders 0.20 in. diam and 0.20 in. high. Cylinders were compressed 90 pct reduction in height between lubricated steel blocks in a tensile machine. Glancing X ray photographs using copper K-alpha radiation were taken at an angle of θ degrees to the compression surface. (111), (002) and (220) rings were analyzed to define the textures shown in Table 1.

The results are in agreement with Barrett⁴ as to types of textures and are essentially in agreement with previous work^{1,2,3} as to the effects of composition. In the wire study³ it was reported that the 4.99 pct zinc alloy had a brass-type texture, while the data in Table 1 indicate a copper-type texture for compression. The wire specimen of the 4.99 pct zinc alloy was re-examined by X rays and it was established that the {100} component still exists in the wire axis. Therefore, Table 2 of Ref. 3 is in

error and should indicate a double [111], [100] copper-type texture for this alloy. This correction results in complete consistency with regard to compositional effects, namely that copper and its alloys containing up to approximately 1 pct aluminum, 5 pct zinc and at least 30 pct nickel§ develop a copper-type texture and more concentrated copper-aluminum and copper-zinc solid solution alloys will form a brass-type texture.

Summary

Compression textures developed in copper and its alpha solid solution alloys of aluminum, nickel and zinc are essentially the same types as those re-

FIG 1—Orientations in copper compressed 97 pct by compression rolling (Barrett).

FIG 2—Orientations in 70-30 brass compressed 97 pct by compression rolling (Barrett).

Table 1 . . . Composition and Texture

Material	Composition		Texture of Compression Plane				
	Wt. Pct	At. Pct	{110}	{111}	{100}	{113}	Fig
Copper*			S		W	M	1
Cu-Ni	30.70	32.44	S		W	M	1
Cu-Al	0.94	2.16	S	W	W	M	Transition between 1 and 2
	3.69	8.28	S	M		W	2
	7.76	16.58	S	M		W	2
Cu-Zn	4.99	4.83	S		W	M	1
	10.16	9.90	S	M		W	2
	12.42	12.12	S	M		W	2
	29.22	30.00	S	M		W	2

* Phosphorous deoxidized electrolytic copper
Note: S = strong, M = medium and W = weak

ported by Barrett⁴ with compositional effects occurring at approximately the same percent additions as previously reported for rolled sheet^{1,2} and drawn wire.³

§ Higher nickel alloys were not investigated.

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1 References are at the end of the note.

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