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高弹性Cu-20Ni-20Mn合金^①

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摘要: 合金中Ni和Mn的各自含量不低于15%,另加少量的Al和Ti。中频或高频炉熔炼,石墨钳锅,熔炼温度1250~1350℃,浇注温度1100~1200℃,800~850℃热轧,650~700℃中间退火,冷加工率达80%。淬火温度650℃,时效温度400~450℃。最佳性能 $\sigma_b=1470$ MPa, $\sigma_{0.2}=1372$ MPa, HV=480, $\delta\geq 2\%$, E=153 GPa, $\rho=54\times 10^{-6}\Omega\cdot\text{cm}$ 。在400℃温度下。 $\sigma_b=1000$ MPa, $\sigma_{0.2}=882$ MPa, E=143 GPa, $\delta\geq 2\%$ 。弹性后效小于铍铜0Be2。时效时进行“Spinodal”分解,形成调幅结构。经定量分析,析出是属于原子由低浓度区间向高浓度区间的上坡扩散过程。因此,析出相难以聚集长大,故不易产生过时效,解释合金耐高温工作的机理。

关键字: 铜合金 锰白铜 弹性材料 热处理强化合金 高温合金

A HIGHLY ELASTIC Cu-20Ni-20Mn ALLOY

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Abstract: Cu-20Ni-20Mn alloy, as a new kind of Cu-based elastic material, has just been studied and successfully manufactured. The alloy has better properties improved by the addition of Al, Ti, Zr, Zn elements etc. The content of Ni is not less than 15%, that of Mn not less than 15%, and the ratio of Ni to Mn is not less than 0.75. The alloy were melted at 1200~1350℃ in median frequency induction furnace and cast at 1100~1200℃. The ingots were hot rolled at 800~850℃ and then annealed at 650~700℃. The cold rolling rate was 80%. After quenching (650℃) and aging (400~450℃), the properties of the alloys were tested: $\sigma_b=1274\sim 1470$ MPa, $\sigma_{0.2}=1176\sim 1372$ MPa, E=137~153 GPa, $\delta\geq 2\%$, HV=400~500, $\rho\geq 54\times 10^{-6}\Omega\cdot\text{cm}$; and $\sigma_b=1000$ MPa, $\sigma_{0.2}=882$ MPa, E=143 GPa, $\delta\geq 2\%$, under high temperature (400℃). The elasticity is less than that of Be-brozen. All other properties are higher than those of Be-brozen except the value, and it can be used at 400℃. By using TEM, the microstructures were studied and the results showed that the spinodal decomposition could take place and the modulated structure was formed. Due to this upward diffusion decomposition, it is difficult for the precipitation to

coarsen. Therefore the overaging phenomenon was not easy to take place in this alloy and the mechanism of the alloy applicable at high temperature can be explained satisfactorily.

Key words: elastic Cu-based alloy copper high temperature alloy manganese white alloy elastic materials

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