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Cu-Fe-Zn (Copper-Iron-Zinc)

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Very recently, [2008Ave] determined an isothermal section at 460 °C for this ternary system in the Zn-rich region.

Binary Systems

There are no intermediate phases in the Cu-Fe system. The phase diagram was recalculated by [2003Tur] for both stable and metastable equilibria. The Cu-Zn phase diagram [Massalski2] is characterized by a series of peritectic reactions, which yield CuZn (β, bcc), Cu_5Zn_8 (γ, $D8_2$-type cubic), $CuZn_3$ (δ, hexagonal?), and $CuZn_4$ (ε, cph). The bcc phase β orders to a B2 structure around 460 °C. The intermediate phases in the Fe-Zn system [2002Rag] are: Γ (Fe_3Zn_{10}; Cu_5Zn_8-type cubic), Γ_1 ($Fe_{11}Zn_{40}$; cubic, space group $F\bar{4}3m$, 408 atoms/cell), δ ($FeZn_{10}$; $FeZn_{10}$-type hexagonal), and ζ ($CoZn_{13}$-type monoclinic).

Ternary Isothermal Section

Low-carbon steel substrates rolled with Cu wire or hammered with a Cu piece were galvanized in zinc baths containing 2.9 at.% Cu. The reaction layers were characterized by scanning electron microscopy and analyzed with energy dispersive spectroscopy. The isothermal section constructed by [2008Ave] at 460 °C near the Zn corner is redrawn in Fig. 1. The Cu-Zn δ phase is not stable at this temperature. No ternary phases were found. Significant solubility of Cu in Γ and δ phases was observed.

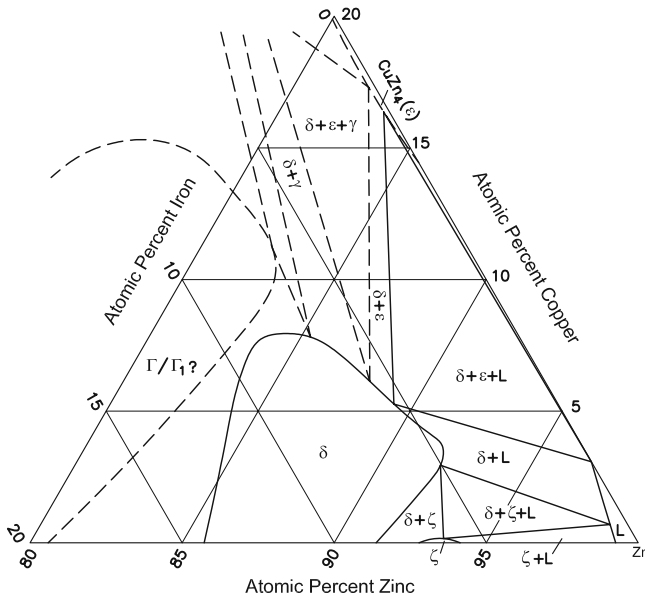

Fig. 1 Cu-Fe-Zn isothermal section at 460 °C for Zn-rich alloys [2008Ave]

References

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