

Structure and Electrical Properties of Ti-Fe Alloy Films

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March, 1982

Films of binary alloy $\text{Ti}_x\text{Fe}_{1-x}$ ($0 < x < 1$) with uniform composition, from 500 Å to 1μ thick, were successfully prepared by d. c. sputtering with a composite cathode containing a Ti plate and Fe wires, or a Fe plate and Ti wires; the diameter of the Ti or Fe wires was 0.8 mm or 0.2 mm, respectively. The wires were electrically welded to the disk parallel to each other. To obtain various compositions, we changed number of the wires.

X-ray and electron diffraction analyses of the films showed the existence of amorphous phases at $0.05 < x < 0.30$, $0.35 < x < 0.50$ and $0.55 < x < 0.83$ and β -Ti (b. c. c.) phase at $0.80 < x < 1$, in addition to α -Fe (b. c. c.) phase at $0 < x < 0.30$, TiFe_2 (hexagonal) Laves phase at $0.25 < x < 0.35$, TiFe (CsCl type) phase at $0.45 < x < 0.55$ and α -Ti (h. c. p.) phase at $0.83 < x < 1$.

Electrical resistivity (ρ) was measured for alloy films of $\text{Ti}_x\text{Fe}_{1-x}$ ($0 < x < 1$), prepared by the composite cathode sputtering. The general trend of ρ against x has the bell like shape, and there are two noticeable dips at 0.33 and 0.47 which correspond to the intermetallic

compounds of TiFe_2 and TiFe , respectively. Films of an amorphous phase with $x=0.7$ have the maximum ρ value of about $700\mu\Omega\text{-cm}$ and TCR of -200 ppm/K .