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Study of the ω Phase in Zr–Nb Alloys by Mössbauer and X-ray Diffuse Scattering

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(*Received* 29 *April* 1974)

The ω phase transformation in Zr–Nb alloys has been studied by measuring the X-ray diffuse scattering in the (110) plane and the Mössbauer diffuse scattering along the ⟨111⟩ direction of separate single crystals with compositions ranging from 8 to 30% Nb. The Mössbauer results show that only the elastic part of the ω diffuse scattering (*i.e.* with energy loss less than about 10^{-8} eV) is shifted from the hexagonal lattice whereas the inelastic portion is centered on the hexagonal lattice. The displacement from the exact hexagonal positions for both the X-ray scattering and the elastic part of the Mössbauer scattering found to be somewhat different from that observed with electron diffraction. The inelastic portion is wider in k space than the elastic, and both are wider than would be expected from the resolution volume. The inelastic-to-elastic peak ratios clearly increase for diffuse ω peaks further out in k space and for higher Nb concentrations. The concentration effect is due mostly to a sharp decrease of the elastic part with increased Nb content. The inelastic portion varies less markedly with composition.