

NEUTRON SCATTERING AND MODELS:- CHROMIUM

by

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Abstract

Differential neutron elastic-scattering cross sections of elemental chromium are measured from 4.5 → 10 MeV in steps of ≈ 0.5 MeV and at >≈ 40 scattering angles distributed between ≈ 17° → 160°. Concurrently differential cross sections for the inelastic neutron excitation of the yrast 2⁺ (1.434 MeV) level in ⁵²Cr are determined. In addition, broad inelastically-scattered neutron groups are observed corresponding to composite excitation of levels up to ≈ 5.5 MeV in the various chromium isotopes. These experimental results are combined with low-energy values previously reported from this laboratory, with recent ≈ 8 → 15 MeV data measured at the Physikalisch-Technische Bundesanstalt and with a 21.6 MeV result from the literature to form an extensive neutron-scattering data base which is interpreted in the context of spherical-optical and coupled-channels (rotational and vibrational) models. These models reasonably describe the observables but indicate rather large energy-dependent parameter trends at low energies similar to those previously reported near the peak of the S₀ strength function in studies at this laboratory. The physical implications of the measurements and models are discussed including deformation, coupling, dispersive and asymmetry effects.