

A HIGH-PRECISION MEASUREMENT OF THE Cu K α EMISSION SPECTRUM

M.H. Mendenhall, A. Henins, L.T. Hudson, C.I. Szabo, D. Windover and J.P. Cline

NIST, Gaithersburg, MD, USA

One of the primary measurement issues addressed with NIST Standard Reference Materials (SRMs) for powder diffraction is that of line position. SRMs for this purpose are certified with respect to lattice parameter, traceable to the SI through precise measurement of the emission spectrum of the X-ray source. Therefore, accurate characterization of the emission spectrum is critical to a minimization of the error bounds on the certified parameters. The presently accepted source for the SI traceable characterization of the Cu K α emission spectrum are the body of work published over several decades and culminating with Hölzer, *et. al*, published in 1997.

The structure of the X-ray emission lines of the Cu K α complex has been measured on a newly commissioned double-crystal instrument, with six-bounce Si <440> optics, in a manner directly traceable to the SI definition of the meter. In this measurement, the entire region from 8020 eV to 8100 eV has been covered with a highly precise angular scale and well-defined system efficiency, providing accurate wavelengths and relative intensities. This measurement is in modest disagreement with reference values for the wavelength of the K α_1 line, and strong disagreement for the wavelength of the K α_2