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Study of optical properties of thin copper films on glass substrate using Kramers-Kronig method

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Abstract

Different thicknesses of 99.97% Cu are deposited on glass substrate by thermal evaporation method at the rate of 2A˚/sec. Kramers-Kronig method is used for the analysis of the reflectivity constant in the range of $200\,\text{nm} < \lambda < 3000\,\text{nm}$, and the reults are compared with the those of bulk sample. For E>2eV, by increasing the thickness, the imaginary part of refraction index, k, increases and real part, n, decreases. At higher energies, both constants reach the asymptotic value of 1. Also, for more thickness of the film, ε_1, the real part of dielectric constant becomes more negative, and ε_2, its imaginary part, decreases. For E<2eV, there are some oscillations on thin films curves. This effect occurs due to the void, grain boundaries, and size effects, which are not the case for bulk copper. The plasma frequency shows thickness dependence, which is similar to that for bulk sample in thickness of 40nm.

Keywords: thin films, optical constants, Kramers Kronig, Drude's theory

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