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Determination of optical constants for heterostructures with inner layer of Cu (Ag) by ellipsometric method

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The heterostructures of $Cr_1Ag_{45}TiO_2$, $Cr_{1.2}Cu_{40}TiO_7$, and $Cr_{1.2}Cu_{43}$, prepared by chemical vapour deposition method were investigated using ellipsometric measurement method in order to calculate optical constants by two models namely Tautz-Lorentz and the effective medium model at the vicinity of the principal angle of the light incidence. Each sample contains a buffer layer of chromium that was deposited on quartz glass. Besides thin upper layer of TiO₂ was deposited on sample by high-frequency magnetron sputtering.

As a result of optical measurements, within the range from 190nm to 25µm and carried out by Semilab SE-2000 device, two ellipsometric parameters ψ (an azimuth of the restored linear polarization) and Δ (a phase shift between the p- and s-components of the polarization vector) were obtained, then the values were compared for the given heterostructures including a thin layer of copper and silver. Thereby it was found that upper layer of TiO₂ deposited on surface does not significantly affect the absorption of these structures in the selected wavelength range. Eventually it was demonstrated 8% difference between the values of the reflection coefficient for the Tautz-Lorentz model and the values for the effective medium model. In addition it was found that heterostructure which contains only a pure layer of copper without upper layer of TiO₂ gives the largest difference for the values of the reflection coefficient when compare these two models (approximately *n*-10%, κ -15%, σ -4%, *R*-10%) and may indicate the formation of such oxide film on sample surface.

Topics

Session A. Physics of condensed matter and spectroscopy

Primary author: Mr HYRMAN, Igor (Taras Shevchenko National University of Kyiv)

Co-authors: KOVANZHI, Petro (Taras Shevchenko National University of Kyiv); Mrs ROSHCHANSKA, Oleksandra (Taras Shevchenko National University of Kyiv); KONDRATENKO, Olha (V.E. Lashkaryov Institute of Semiconductor Physics,); Prof. POPERENKO, Leonid (Taras Shevchenko National University of Kyiv, Faculty of Physics, Chair of Optics)

Presenter: Mr HYRMAN, Igor (Taras Shevchenko National University of Kyiv)

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