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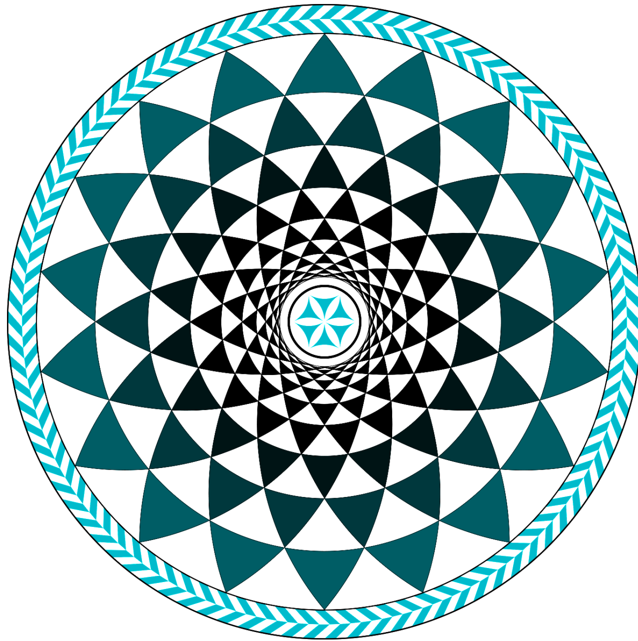

Multiscale Phenomena in Condensed Matter
Online conference for young researchers

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Polish Academy of Sciences

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Influence of the parallelepiped form localized defects on ellipsometry data: scale modeling

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This paper is devoted to the problem of the analysis of ellipsometric data of the surface with localized defects (different phases, blistering, grains etc.). In these cases, often is not even a clear understanding of how certain types of defects affect the values measured in an ellipsometric experiment. Earlier, in the works devoted to the study of the radiation stability of the precipitation-hardened CuCrZr alloy, anomalous (non-classical) angular dependences of the ellipsometric parameters were found. It was assumed that this is due to the scattering of radiation by the secondary phases protruding above the surface of the copper matrix. Accordingly, when the angle of incidence is changed, the detector receives the radiation that is reflected from different parts of the sample.

This experiment was carried out using a terahertz ellipsometer with an operating wavelength of 2.14 mm. The ellipsometric parameters of ferrite samples with a defect in the form of a parallelepiped are measured. The size of the defect was varied, which made it possible to determine the minimum size of the defect distinguishable by the ellipsometric technique. The trend of the dependences of the ellipsometric parameters was determined as a function of the incidence angle in the presence of a defect several times larger than the wavelength. A qualitative change in the dependences of the ellipsometric parameters on the angle of incidence of radiation with a decrease in the size of the defect has been determined. The size of the defect at which the ellipsometric parameters practically coincide with the data for a clean surface is determined. The comparison of the results of the ellipsometric and the reflectometric techniques are carried out. The model was confirmed, according to which localized defects, the dimensions of which are slightly smaller than the probe radiation wavelength, become "invisible" for ellipsometry, although they strongly affect the specular reflection coefficient.