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On the analyses of grazing incidence small angle neutron scattering patterns arising from regular nanostructured arrays

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We report a new, simplified approach for analysis of grazing incidence scattering measurements used to investigate supported lipid bilayers on hexagonal arrays of nanowires. The method exploits measurements of different physical structures or different scattering contrasts in studies of a fixed array of nanowires. The ratio of the intensity at peaks can be calculated for models simply as a ratio of form factors or scattering functions for the different conditions. The ratios of experimentally measured peak intensities are compared with models to provide structural information. Direct consideration of the ratios of observed intensities avoids many complications of quantitative calculation of grazing incidence scattering that are related to resolution, depth of penetration, refraction, and background scattering. The present work enables the determination of the thickness and density of a mixed lipid layer formed by vesicle fusion on the curved surface of nanowires which can be directly compared with that on the flat substrate between the nanowires. Suggestions for further developments of this methodology are provided.

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