Modeling surface imperfections in thin films and nanostructured surfaces - DTU Orbit (01/04/2019)

Modeling surface imperfections in thin films and nanostructured surfaces
Accurate scatterometry and ellipsometry characterization of non-perfect thin films and nanostructured surfaces are challenging. Imperfections like surface roughness make the associated modelling and inverse problem solution difficult due to the lack of knowledge about the imperfection on the surface. Combining measurement data from several instruments increases the knowledge of non-perfect surfaces. In this paper we investigate how to incorporate this knowledge of surface imperfection into inverse methods used in scatterometry and ellipsometry using the Rigorous Coupled Wave Analysis. Three classes of imperfections are examined. The imperfections are introduced as periodic structures with a super cell periods ten times larger than the simple grating period. Two classes of imperfections concern the grating and one class concern the substrate. It is shown that imperfections of a few nanometers can severely change the reflective response on silicon gratings. Inverse scatterometry analyses of gratings with imperfection using simulated data with white noise have been performed. The results show that scatterometry is a robust technology that is able to characterize grating imperfections provided that the imperfection class is known.

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