- morphology

In the prior art, however, for the most part individual thin transparent or semi-transparent layers or two-layer systems are measured. If multilayer systems are investigated, then there is no structured surface present. Due to the complexity, in the prior art, either multilayer systems or periodic structures are measured. For multilayer systems, smooth surfaces are a prerequisite in the prior art. Further problems in the prior art are often an inadequate accuracy of the simulations from the measurement of complex samples. It is even more difficult if the structures also have even more complex structural forms. Then, adaptation of measurement and simulation is still a problem.

Embodiments of the present invention provide an improved method and an improved device for measuring a multilayered substrate.

All combinations made up of at least two features specified in the description, the claims and/or the figures also fall within the scope of the invention. When value ranges are specified, values lying within the limits mentioned should also be disclosed as limit values and be claimable in any desired combination.

According to a first aspect of the present invention, there is provided a method for measuring a multilayered substrate, particularly with at least one structure with critical dimensions, particularly with a surface structure with critical dimensions, wherein the method has at least the following steps, particularly the following procedure:

– producing the substrate with a plurality of layers, particularly with a structure, particularly with a structure on a surface of an uppermost layer, wherein the dimensions of the layers and in particular the structures are known,

– measuring the substrate, and in particular the structure, using at least one measuring technology,

– creating a simulation of the substrate using the measurement results from the measurement of the substrate,

– comparing the measurement results with simulation results from the simulation of the substrate,

– optimizing the simulation and renewed creation of a simulation of the substrate using the measurement results from the measurement of the substrate, in the event that there is a deviation of the measurement results from the simulation results, or calculating parameters of further substrates using the simulation created, in the event that the measurement results correspond to the simulation results.

Advantageously, the simulation created can be used for the optimization of desired layer thicknesses, structures and materials.

According to a second aspect of the present invention, there is provided a device for measuring a multilayered substrate, particularly with at least one structure with critical dimensions, particularly with a surface structure with critical dimensions, having:

– means for measuring the substrate, and in particular the structure, using at least one measuring technology,

– means for creating a simulation of the substrate using the measurement results from the measurement of the substrate,

– means for comparing the measurement results with simulation results from the simulation of the substrate,

– means for the optimization of the simulation and renewed creation of a simulation of the substrate using the measurement results from the measurement of the substrate,

– means for analysing and optimizing further substrates (1, 1‘, 1‘‘) by reconstructing layer and/or structure parameters with the aid of the simulation created on the basis of measurement results from the measurement of the further substrates (1, 1‘, 1‘‘).

Advantageously, thin transparent or semi-transparent layers or two-layer systems or multilayer systems can be measured, wherein structured surfaces can also