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Structural investigations of human hairs by spectrally resolved ellipsometry BENJAMIN SCHULZ, D. CHAN, M. RUEBHAUSEN, Institute of Applied Physics, Jungiusstrasse 11, D-20355 Hamburg, Germany, S. WESSEL, R. WEPF, Beierdorf AG, Hamburg, Germany — Human hair is a biological layered system composed of two major layers, the cortex and the cuticle. We show spectrally resolved ellipsometry measurements of the ellipsometric parameters Ψ and Δ of single human hairs. The spectra reflect the layered nature of hair and the optical anisotropy of the hairs structure. In addition, measurements on strands of human hair show a high reproducibility of the ellipsometric parameters for different hair fiber bundles from the same person. Based on the measurements, we develop a model of the dielectric function of hair that explains the spectra. This model includes the dielectric properties of the cuticle and cortex as well as their associated layer thicknesses. In addition, surface roughness effects modelled by a roughness layer with an complex refractive index given by an effective medium approach can have a significant effect on the measurements. We derive values for the parameters of the cuticle surface roughness layer of the thickness $d_{ACu} = 273 - 360 \text{ nm}$ and the air inclusion $f_A = 0.6 - 5.7\%$. [1] accepted for publication in J. Biomed Opt., 2005

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