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Interactive comment on "Optical properties of humic-like substances (HULIS) in biomass-burning aerosols" *by* A. Hoffer et al.

Anonymous Referee #3

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General comments:

This is an interesting paper on the optical and especially on the wavelength-dependent absorption properties of humic-like substances (HULIS) isolated from biomass burning aerosol collected during the LBA-SMOCC campaign. Absorption and scattering coefficients were measured in the laboratory utilising the following two methods: First, on-line experiments on airborne particles generated from the isolated HULIS and, second, absorption spectra of aqueous HULIS solutions. From these measurements mass-specific absorption and scattering cross-sections and the complex refractive index were deduced at λ=532 nm. In addition, the wavelenght-dependence of the absorption coefficient, i.e. the Angström exponent, was deduced from the absorption

spectra. A strong spectral dependence of UV/VIS light absorption was found and the authors conclude from their data that towards the UV, i.e. down to 300 nm, the absorption by HULIS becomes significant (50 %) relative to that of BC. Thus, HULIS might be an important factor for atmospheric processes in sense of radiative transport and photochemical processes. The data are new, interesting and of strong relevance for the scope of ACP. However, some points are not sufficiently discussed and the argumentation occasionally seems to be inconsistent. Thus, the authors should address to the following points.

Specific comments:

Section 2.2. The size distributions of the HULIS particles were measured by a SMPS system. The authors give a literature-based sizing accuracy of about 3 % and a particle number concentration uncertainty of about 10 %. Here a figure showing the quality of the SMPS measurements would be helpful. The size distribution measurements were used for the iterative determination of the refractive index based on Mie calculations (Sec. 2.3). Since Mie calculations are very sensitive to the actual particle size, the question raises how the uncertainties in the SMPS measurements evolve in the determination of the refractive index. The authors give in Table 1 the results of the real and imaginary part of the refractive index with uncertainties which are astonishingly small in this respect.

Section 2.2. The nephelometer results were corrected for angular truncation errors based on the Mie calculations. Now, for the small sizes of the HULIS particles the angular truncation can be neglected, but the systematic error induced by nonlambertian light distribution within the nephelometer might be significant (at least for the TSI3563 nephelometer as discussed in Anderson et al. 1996). The authors should address to this point.

Section 3.1. The authors speculate on pages 6 and 7 that the discrepancy between the imaginary refractive indices measured by the photospectroscopic and the on-line

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method might be due to water uptake by the nigrosin particles. Since water uptake might also change the real refractive index, the explanation seems to be inconsistent with the good aggreement found for the real refractive indices. Some Mie calculations might be helpful in this context.

Section 3.2, first sentence: "Figure 3 shows the absorption spectra of HULIS isolated from day and night samples.". This seems to be inconsistent with Section 3.1 where only one nighttime sample was analysed with the spectrophotometric method. If indeed more samples have been analysed what is the reason for deducing the imaginary refractive index only for one nighttime sample?

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 7341, 2005.