

Interactive comment on “Dynamic changes of optical and chemical properties of tar ball aerosols by atmospheric photochemical aging” by Chunlin Li et al.

Anonymous Referee #2

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This manuscript describes the systematic study of how the chemical and optical properties of laboratory-generated tar ball aerosols change upon reaction with OH, exposure to 254 nm light and oxidation in the presence of NO_x. What is really interesting about this study is that the authors extracted the polar (water-soluble) and non-polar fractions and found significant differences in both chemical composition and the responses to oxidation. The formation of organic-nitrates was found to increase absorption, which at least partially offsets the decrease in absorption (“bleaching”) observed upon photolysis and oxidation by OH radicals. By using a range of EADs (Equivalent daytime Atmospheric oxidation Days) of ~ 0.5 -7 days, the authors explore atmospherically relevant extents of oxidation.

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The use and description of a controlled method for obtaining reproducible tar ball extract samples in the laboratory is also important. This procedure allows the authors to make systematic studies of semi-authentic aerosol samples that appear to be consistent with ambient tar ball samples.

Overall, this manuscript is well written, and the data are interpreted carefully. Given the growing evidence of the importance of tar balls in atmospheric aerosols and the open questions about brown carbon's molecular composition, this manuscript is an important contribution in this area and is appropriate for ACPD.

Specific comments:

1. Since the photolysis was carried out at only one wavelength, 254 nm, statements about increases in absorption from the formation of organic-nitrates offsetting bleaching from photolysis should be highly qualified.
2. Equation 4: How is the mass concentration of the solution, C , determined in calculating the MAC (mass absorption cross section)?
3. Line 597: "EAD" should be "EDA".
4. What fraction of the mass and/or the absorption is attributable to the polar vs. the non-polar fractions?

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