

Interactive comment on “Biomass-burning derived particles from a wide variety of fuels: Part 1: Properties of primary particles” by Crystal D. McClure et al.

Anonymous Referee #1

Received and published: 10 September 2019

General comments: The authors have comprehensively investigated the microphysical and optical properties of primary carbonaceous particles derived from various types of biomass-burning and their empirical relationships with some bulk parameters such as MCE and OA/BC ratio, on the basis of fire-chamber experiments. These results will be useful as a basis for interpreting the field-campaign data and for parameterization of size distribution and absorbing properties of OA, BrC, BC for biomass-burning plumes. The manuscript is logically written and display items are all easy to understand. However, I have a serious concern in the author's interpretation of their experimental results as detailed below. I can recommend publication of this manuscript after the authors convincingly address this issue.

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Major critical comment: The authors observed the MAC_{BC} at 781 nm was nearly independent of R_{coat_BC} . And they just mentioned that this negligible coating-induced absorption enhancement of BC was consistent with previous results by McMeeking et al. (2014), without providing detailed physical interpretations. To my intuition, the coating-induced enhancement for an absorbing core embedded inside a non-absorbing host particle is a general consequence of electromagnetics law (i.e., Maxwell equation), and should not be violated excepting very rare cases (I don't know any example of such cases). One possible condition potentially consistent with the negligible enhancement is that the measured rBC-containing aerosols are in the morphological form of “attached-type” rather than “coated-type”. However, the attached-type assumption seems to be inconsistent with the principle of coating measurement using the SP-AMS, because the coating materials on rBC may not effectively vaporize in that type. The authors should provide convincing theoretical discussion supporting the author's assumption that the observed negligible coating-induced enhancement is a real physical phenomenon (and not a consequence of some measurement artifacts). In this paper, a convincing interpretation of the negligible coating-induced enhancement is also needed for supporting the robustness of the BrC estimate according to Eq.(6).

Minor comments Line 68. Typo: very -> vary

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-707>, 2019.

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