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Supplemental Material for "Emission Factor Ratios, SOA Mass Yields, and the Impact of Vehicular Emissions on SOA Formation"

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In this section we show that the SVOOA/ΔCO enhancement ratios measured at the Pasadena ground site cannot be explained even even if 100% of the NMOG is assumed to have reacted after 0.45 days of photochemical aging, and even if the highest SOA yields reported by *Gordon et al.* (2013) are used. To do so, we have conducted additional analyses assuming Y_{gas} = 16% and Y_{gas} = 25%, which are the upper limits of the LEV1 and LEV2 vehicle classes, respectively, reported by *Gordon et al.* (2013). As shown in Figures S1B-C, although increasing Y_{gas} to its upper limit does improve agreement to some extent, the predicted and required yields still differ by more than a factor of 3 even when using the highest yields reported by *Gordon et al.* (2013). To account for the uncertainty associated with calculating the fraction of emitted SOA precursors that have undergone chemical reaction after 0.45 days of photochemical aging, an additional sensitivity analysis was conducted in which 100% of the emitted NMOG is assumed to have reacted (see Figure S2). As shown in Figure S2, assuming 100% conversion of NMOG effectively reduces the required SOA mass yields by a factor of 2. The predicted yields shown in Figure S2C are still lower than the required yields by a factor of $\sim$1.7. We emphasize that there is a significant lack of closure between expected and observed organic aerosol concentrations attributable to fossil-fuel emissions even when assuming 100% NMOG conversion and an LDGV fleet-averaged SOA mass yield of 25%. Both assumptions are expected to be very unrepresentative of ambient conditions in California.

References

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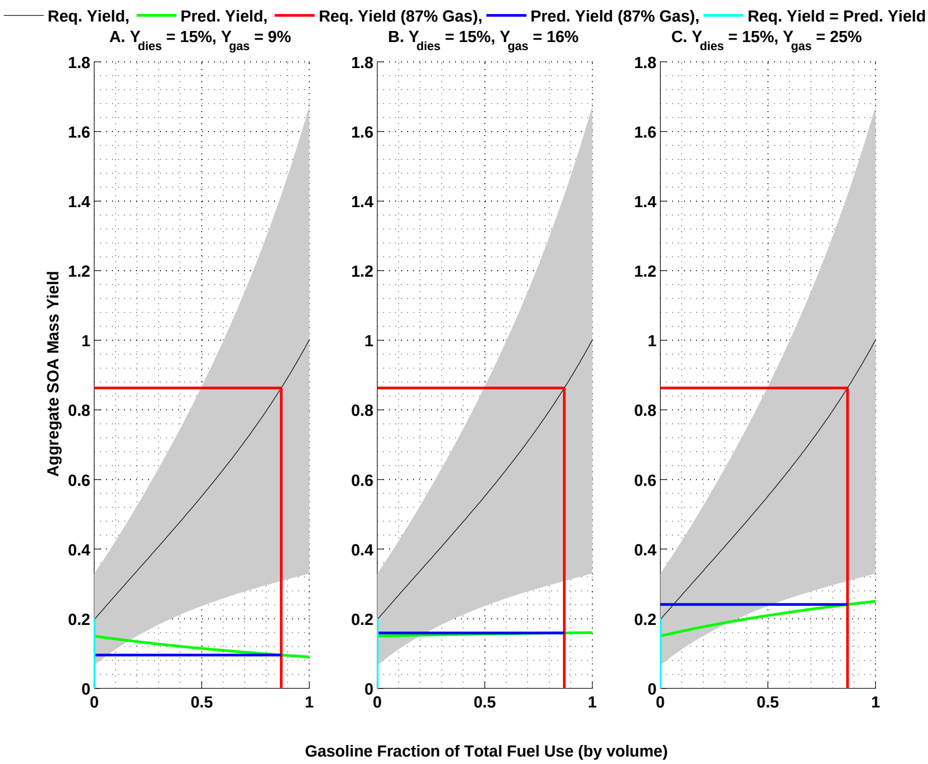

Fig. S1. Same as Figure 3, except emission factors for gasoline-fueled vehicles and aggregate SOA mass yields are based on the experimentally derived values reported in *Gordon et al.* (2013). (A) Aggregate SOA mass yield for gasoline exhaust is 9%, which is considered representative of the California LDGV fleet. (B) Aggregate SOA mass yield for gasoline exhaust is 16%, which is the upper limit for LEV1 vehicles (*Gordon et al.*, 2013). (C) Aggregate SOA mass yield for gasoline exhaust is 25%, which is the upper limit for LEV2 vehicles (*Gordon et al.*, 2013). Predicted yield error bars are not included because the predicted yields in (C) are a conservative upper limit.

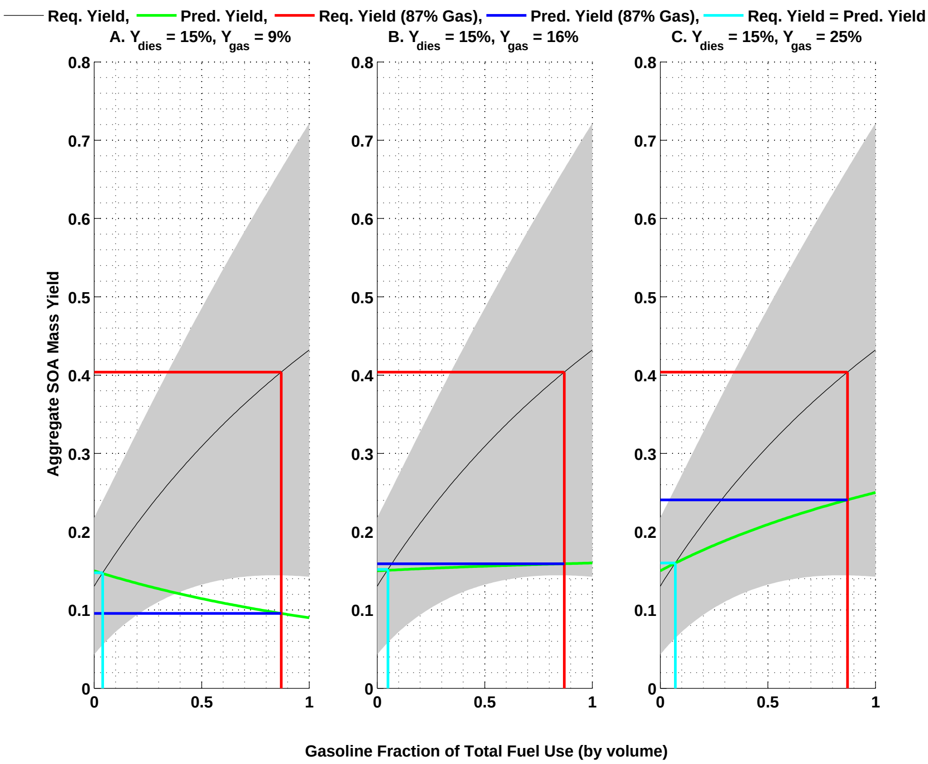

Fig. S2. Same as Figure S1, except 100% of the gas-phase emissions are assumed to have reacted after 0.45 days of photochemical aging.