Supporting Information

Effects of photochemical oxidation on the mixing state and light absorption of black carbon in the urban atmosphere of China

Qiyuan Wang\textsuperscript{1,2}, Rujin Huang\textsuperscript{1,2,3,*}, Zhuzi Zhao\textsuperscript{1,2}, Junji Cao\textsuperscript{1,2,4,*}, Haiyan Ni\textsuperscript{1}, Xuexi Tie\textsuperscript{1,2}, Chongshu Zhu\textsuperscript{1,2}, Zhenxing Shen\textsuperscript{5}, Meng Wang\textsuperscript{1}, Wenting Dai\textsuperscript{1,2}, Yongming Han\textsuperscript{1,2,4}, Ningning Zhang\textsuperscript{1,2} and André S. H. Prévôt\textsuperscript{1,6}

\textsuperscript{1}Key Laboratory of Aerosol Chemistry and Physics, Institute of Earth Environment, Chinese Academy of Sciences, Xi’an 710061, China
\textsuperscript{2}State Key Laboratory of Loess and Quaternary Geology, Institute of Earth Environment, Chinese Academy of Sciences, Xi’an 710061, China
\textsuperscript{3}Centre for Atmospheric and Marine Sciences, Xiamen Huaxia University, Xiamen 361024, China
\textsuperscript{4}Institute of Global Environmental Change, Xi’an Jiaotong University, Xi’an 710049, China
\textsuperscript{5}Department of Environmental Sciences and Engineering, Xi’an Jiaotong University, Xi’an 710049, China
\textsuperscript{6}Laboratory of Atmospheric Chemistry, Paul Scherrer Institute (PSI), 5232 Villigen, Switzerland

Correspondence to: Junji Cao (cao@loess.llqg.ac.cn) or Rujin Huang (rujin.huang@ieecas.cn)
Figure S1. Locations of the sampling sites at Beijing and Xi’an, China.
Figure S2. Time-series of 5-min average (a) absolute humidity (AH), (b) O₃ and oxidant (OX = O₃ + NO₂) mixing ratios, and (c) number fraction of thickly-coated rBC (F_rBC). The 24-h moving averages (colored lines) are included to make the general trends clearer. The yellow vertical areas are used to highlight F_rBC values that broadly track the increases in OX while the grey shades show F_rBC values don’t track OX. The light cyan areas show decreasing trends of OX.
Figure S3. Diurnal variations of O₃, NO, and NOx mixing ratios at (a) Beijing and (b) Xi’an. The data plotted are the hourly-averages of all observations.
Figure S4. Frequency distribution of refractory black carbon mass absorption cross-section (MAC_{rBC}) for the samples from Xi’an.