Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-156-RC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Formation of Reactive Nitrogen Oxides from Urban Grime Photochemistry" *by* A. M. Baergen and D. J. Donaldson

Anonymous Referee #2

Received and published: 10 March 2016

Manuscript by Alyson Baergen and D. J. Donaldson focuses on formation of HONO, a key chemical species and/or reaction intermediate in atmospheric chemistry, during photolysis of urban grime. Given the fact that sources and formation of daytime HONO in urban setup are poorly understood, this study reveals potential chemical and photochemical reaction pathways and mechanisms to yield HONO. The knowledge gained in this study will lead and redirect the scientists studying urban atmosphere to closely look at heterogeneous photochemistry of urban grime. Authors present scientific results from a series of experiments, in a combined approach of Incoherent Broad Band Cavity Enhanced Spectroscopy (IBBCES) and Quartz Crystal Microbalance (QCM), to clearly support their major conclusions on photochemical production of HONO and wa-

ter uptake on urban grime. This study is also significant due to the fact that it reports the dependence of HONO production on relative humidity with sufficient evidence. Considering all the above facts, I recommend that this article is publishable on ACP with minor revisions. No further review is required.

Specific Questions: 1. Page 6, line 180. In photolysis experiments, authors allowed the signal to return to baseline for 60 min. Highlighting that gas phase NO2 decrease as a function of RH, have authors considered any secondary reactions of HONO or NO2, i.e. acid hydrolysis of NO2, during the 60min dark periods of the experiment?

2. Page 7, line 234. Since the inorganic nitrate does not show a direct link to the source of gas-phase nitrogen species and authors speculate that organo-nitrate may have a role, have authors considered investigating the change in the total nitrogen in grime samples before and after photochemical experiments.

3. Page 8, line 267. The work cited here by Grassian and co-workers have reported decrease in %nitrate loss between %RH 20 and 80, due to increase in re-adsorption of gas phase NO2 at higher RHs. Did authors notice similar observation(s) in the current study? Can this be one of the dark reaction occurring during the above mentioned 60 min dark period?

4. Page 7, line 215. The water uptake on grime seems to follow more like a condensation isotherm rather than a typical water adsorption isotherm with a monolayer formation. If this is the case, does the multiplayers formation of water block surface sites or limit photolysis products after %RH 35?

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-156, 2016.