Dirt, Dust, and Deleterious Gases
The Interaction of NO\textsubscript{x} with Road Dust and Humic Acid

Zoë Golay, Stephanie Jones, D. J. Donaldson

1. Introduction & Big Picture

Developing an understanding of the heterogeneous chemistry of NO\textsubscript{x} (NO\textsubscript{2} + NO) with surfaces is vital. NO\textsubscript{x} is a precursor to ozone, and is also partially responsible for urban smog, acid rain and other harmful pollution events\textsuperscript{1,2}. Road dust is the most important human-generated source of fine particulate matter, composed of organic and inorganic materials. Humic acids are the most available organic species on the surface of the earth. Thus, road dust chemistry may resemble a combination of TiO\textsubscript{2} (inorganic) and humic acid (organic). Previous work has shown that TiO\textsubscript{2} photocatalyzes reactions of NO\textsubscript{2}. Do road dust and humic acid also have this effect on NO\textsubscript{x}?

2. Experimental method

A) TiO\textsubscript{2}
Light induces photocatalysis and changes in NO\textsubscript{x} concentrations when either NO\textsubscript{2} and NO were added to TiO\textsubscript{2}. Here we show NO and NO\textsubscript{2} decreasing with illumination.

B) Humic Acid
Light has no effect on NO\textsubscript{x}, but adsorption occurs.

NO\textsubscript{2} main gas: small changes in NO\textsubscript{2}
NO main gas: no changes in NO\textsubscript{2}

C) Road Dust – Collected from Huron Street
Light has no effect on NO\textsubscript{x}, but adsorption occurs.

NO\textsubscript{2} main gas: changes in NO\textsubscript{2} were opposite to changes in NO\textsubscript{2}
NO main gas: only changes in NO\textsubscript{2} concentration

Road dust is composed of organic and inorganic material. Results may resemble a combination of TiO\textsubscript{2} and humic acid behaviour.

3. Results

4. Conclusion

- Road dust and humic acid adsorb NO\textsubscript{x}, but no photochemistry occurs
- Future work will involve understanding whether these reactions scale with mass and surface area, and what the product of these reactions are

References

2. Jones, S. H.; Hosse, F. P. R.; Yang, X.; Donaldson, D. J. Loss of NO(g) to painted surfaces and its re-emission with indoor illumination. Indoor Air 2020, 00, 1-8, DOI: 10.1111/ina.12741