



*Supplement of*

## **Complex chemical composition of colored surface films formed from reactions of propanal in sulfuric acid at upper troposphere/lower stratosphere aerosol acidities**

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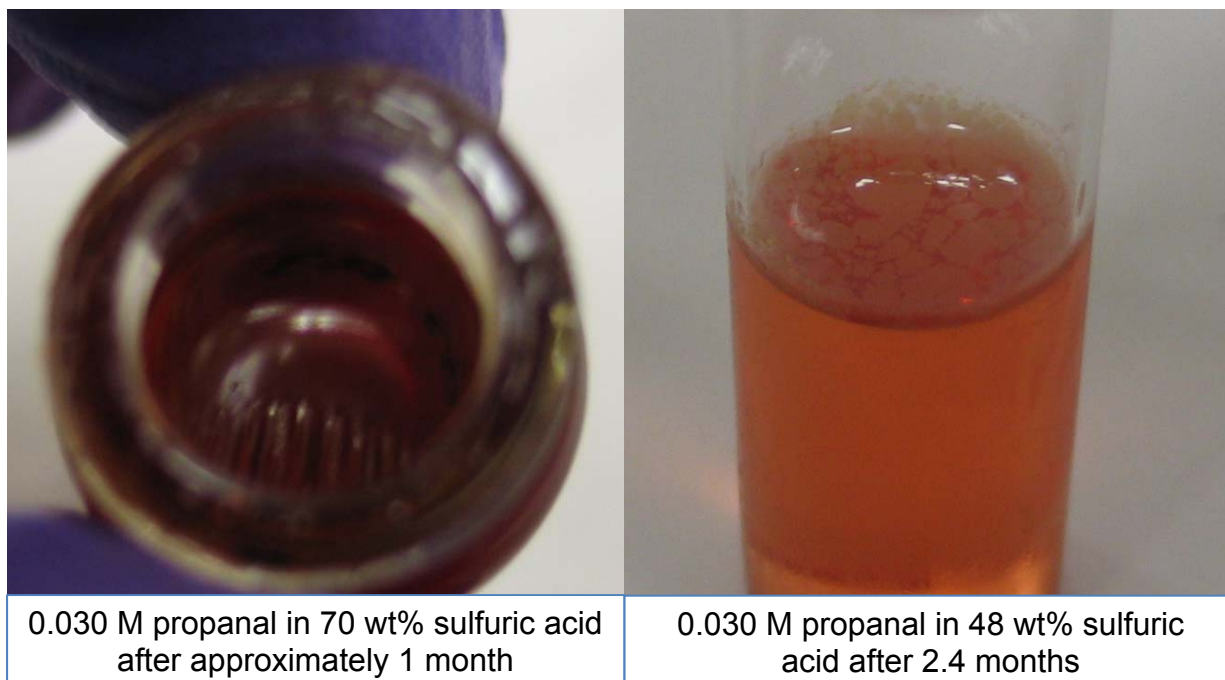


Figure S1. Photographs of sample surface films formed by propanal in sulfuric acid solutions. The photo on the left illustrates a surface film that has folded up on itself upon movement of the vial, forming “permanent” ripples. (Note that the focus is on the ripples, so the vial is blurry.) The photo on the right illustrates a surface film that has broken up (possibly due in part to movement of the vial) and no longer covers the entire liquid surface.

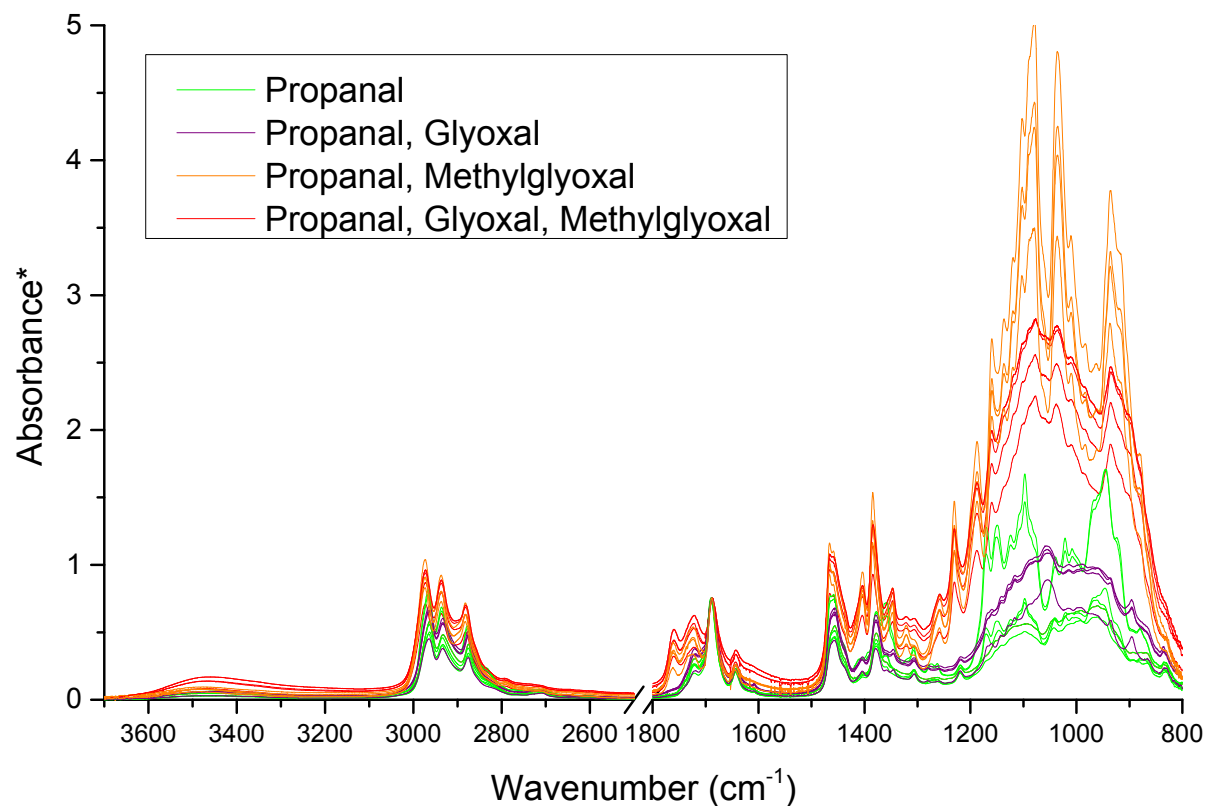


Figure S2. Replicates (corresponding to Figure 6) for the ATR-FTIR spectra of surface films formed on mixtures of propanal with glyoxal and/or methylglyoxal in 48 wt% H<sub>2</sub>SO<sub>4</sub> (7 days after mixing). Solutions are 0.30 M in each organic. The region from 2500-1800 cm<sup>-1</sup> is omitted for clarity. \*Absorbance spectra are scaled to the C=O peak at 1690 cm<sup>-1</sup> from aldol condensation products (predominantly 2-methyl-2-pentenal) in order to illustrate differences between relative peak intensities.

These replicates correspond to Figure 6 (where only one spectrum is shown per mixture for clarity) and show variability in relative peak intensities for spectra of films formed on replicate solutions of the same composition. This variability is most likely due to inhomogeneity in the solid mixtures of multiple chemical species. The replicate spectra are provided here to demonstrate that the differences between organic mixtures discussed in the manuscript are robust even when replicate variability is taken into account and are therefore due to differing chemical pathways and are not simply sampling artifacts.