

# Surfactant Effects in Irradiated, Hanging-Droplet, Aqueous-Phase Glyoxal/Ammonium Sulfate Aerosol Mimic System

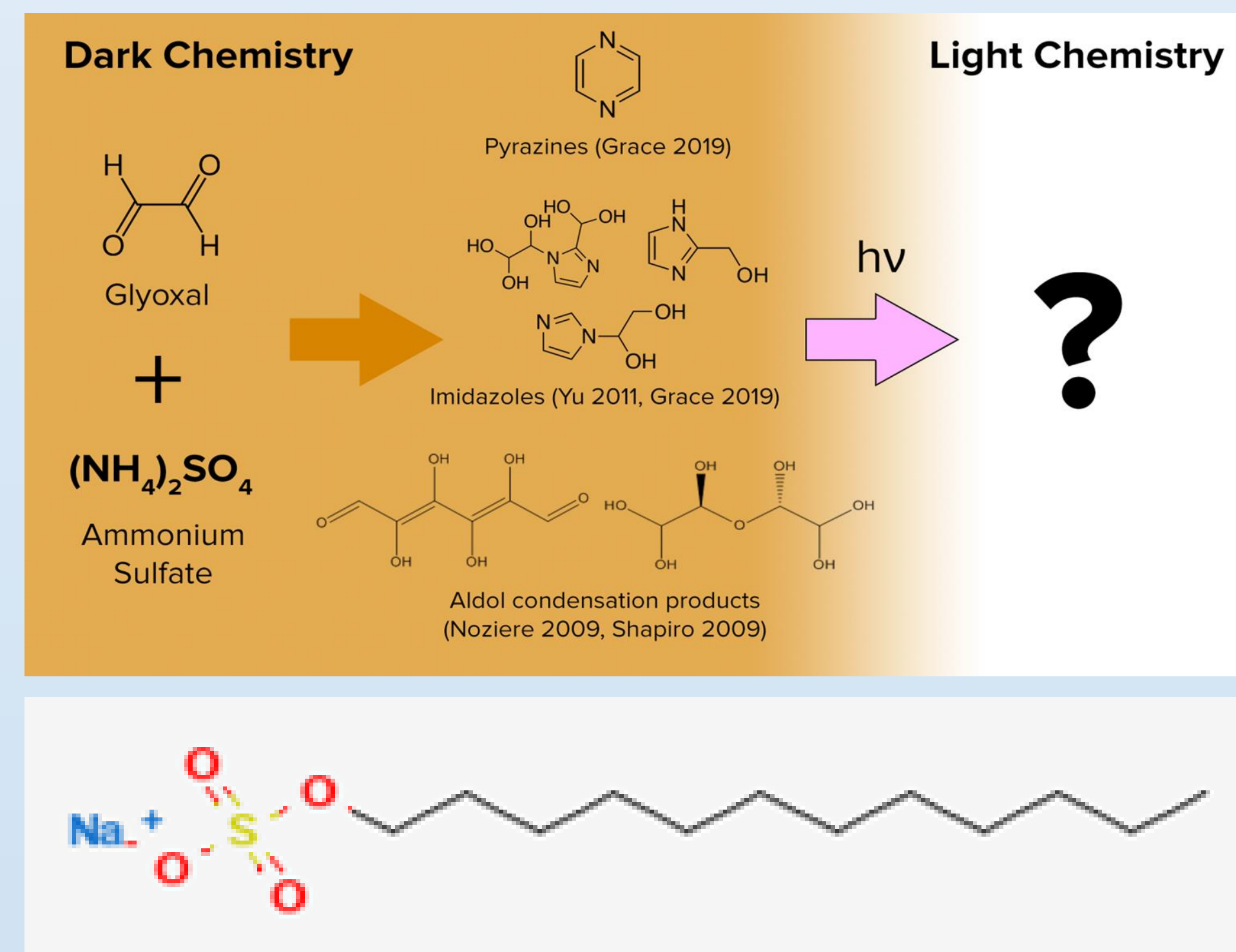
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## Introduction

- Secondary organic aerosol (SOA) are formed via in situ interactions with volatile organic compounds (VOCs)
- Our work has shown that when exposed to UV light Methyl/glyoxal (MG) surface tension changes as a function of time
- The main goal was to analyze the effects of irradiation on Glyoxal (G) and Ammonium Sulfate (AS) and see if there was any concentration dependencies.
- In addition, surface tension effects as a function of bulk organic concentration will be investigated in the presence of extra surfactants

## Carbonyl Containing Volatile Organic Compounds

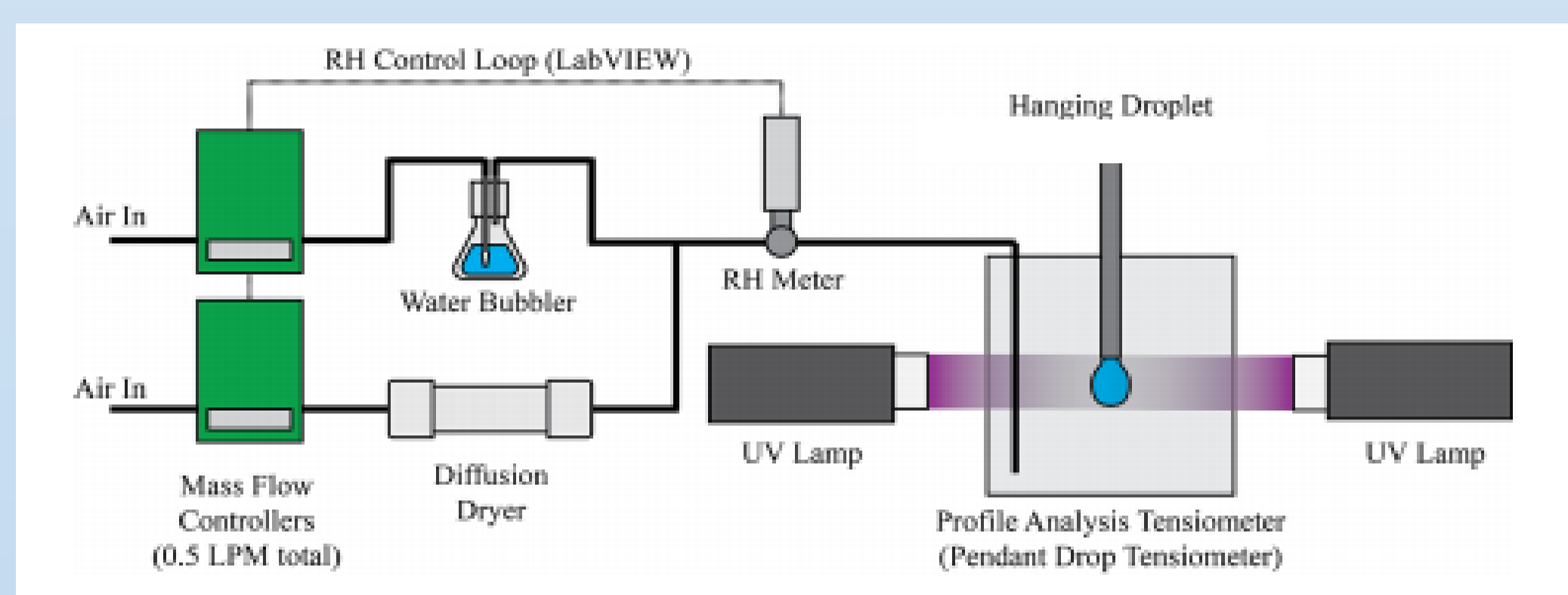


Carbonyl-containing VOCs (CVOCs) such as Glyoxal (G) and Methylglyoxal (MG) are SOA precursors.

**Figure 1:** Graphical representation of dark chemistry occurring with the mixture of G and AS. It produces pyrazine and imidazole which are known to absorb UV radiation. Currently not much is known of the product when exposed to UV<sup>1</sup>

**Figure 2:** The chemical structure of Sodium dodecyl sulfate. It contains both a strong polar and non-polar region making it a surface active surfactant

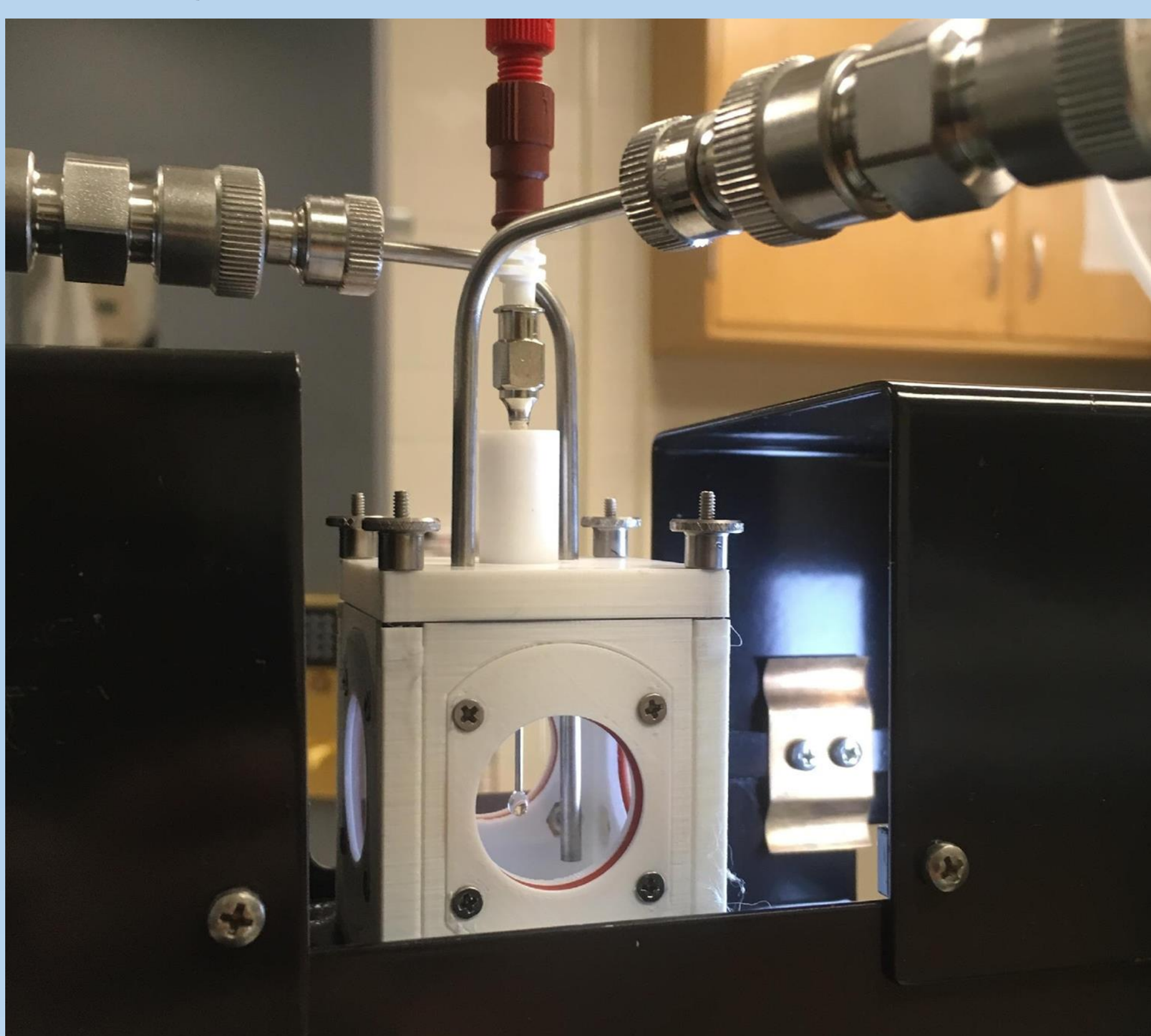
## Methods



**Figure 3:** Schematic of Profile Analysis Tensiometer (PAT) experimental setup<sup>2</sup>

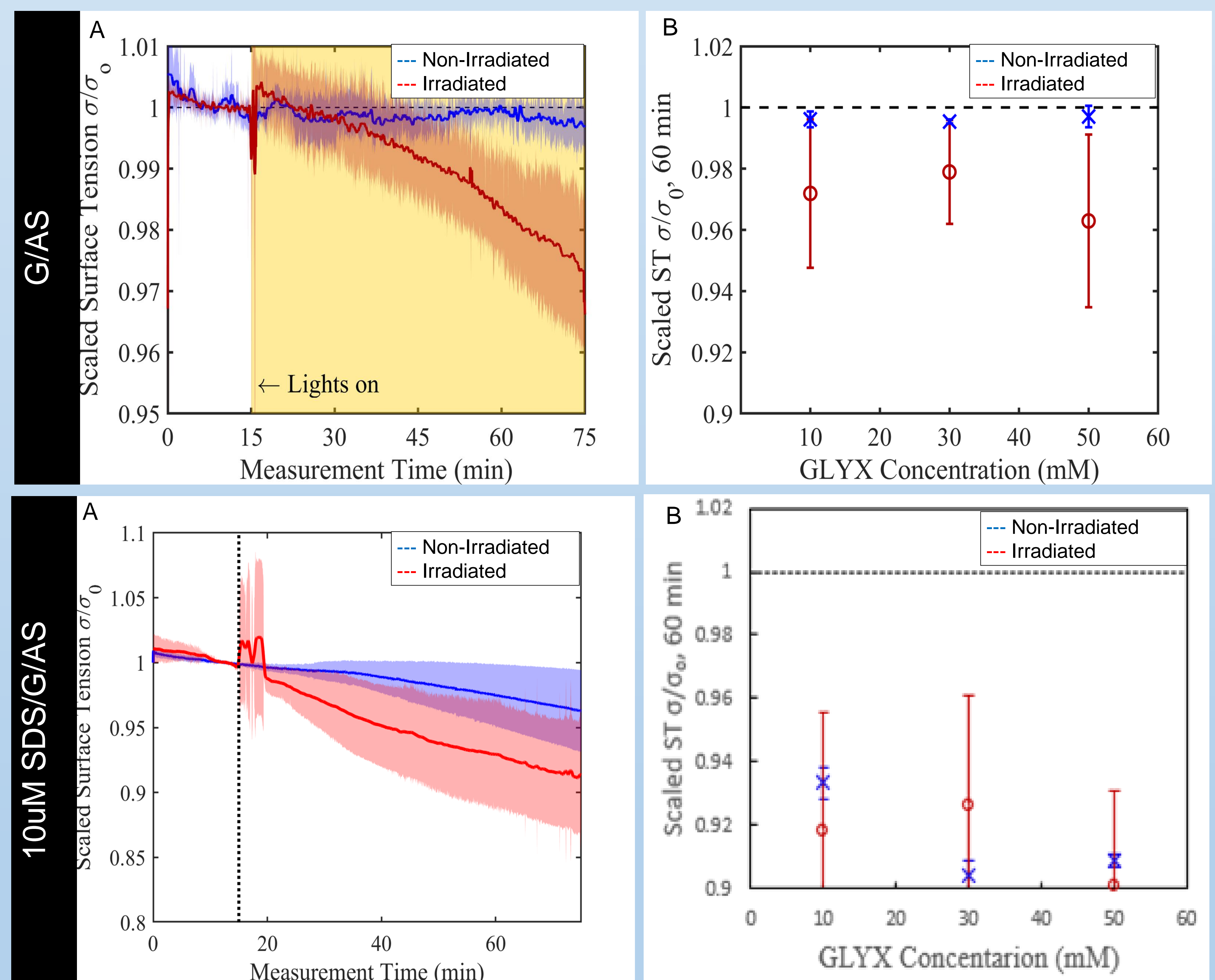
- Surface tension of hanging droplet, 24 h aged AS/G mimic solution were measured
- 2x2x3 full factorial design was used

- Lights (on/off)
- Addition of Surfactants (none/ SDS)
- Concentration of Glyoxal (10mM, 30mM, & 50mM)



**Figure 4:** An example of hanging droplet in the PAT

## Results & Discussion



**Figure 5:** (A) time resolved (B) concentration table showing how surface tension changes both in irradiated and non irradiated conditions as a function of time and concentration.

**Table 1:** An ANOVA analysis on the data. In both testing conditions time was found to be significant as it is less than  $\alpha$  of 0.05. While exposure was found only to be significant in the absence of SDS.

	G/AS	10uM SDS/G/AS
<b>Exposure</b>	0.002	0.563
<b>Time</b>	.016	<.001
<b>Glyoxal Conc.</b>	0.135	0.216

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**References:** [1] Sharp, Grace, Ma, Woo, Galloway ACS Earth Space Chem. 2021, 5, 8, 1902–1915, [2] Beier, Cotter, Galloway, Woo ACS Earth and Space Chemistry 2019 3 (7), 1208-1215 [3] Grace, Lugos, Ma, Griffith, Hendrickson, Woo, Galloway ACS Earth Space Chem. 2020, 4, 7, 1104–1113