

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

*Daphna Fertl*<sup>1</sup>, *Melissa M. Galloway*<sup>2</sup>, *Joseph L. Woo*<sup>1</sup>

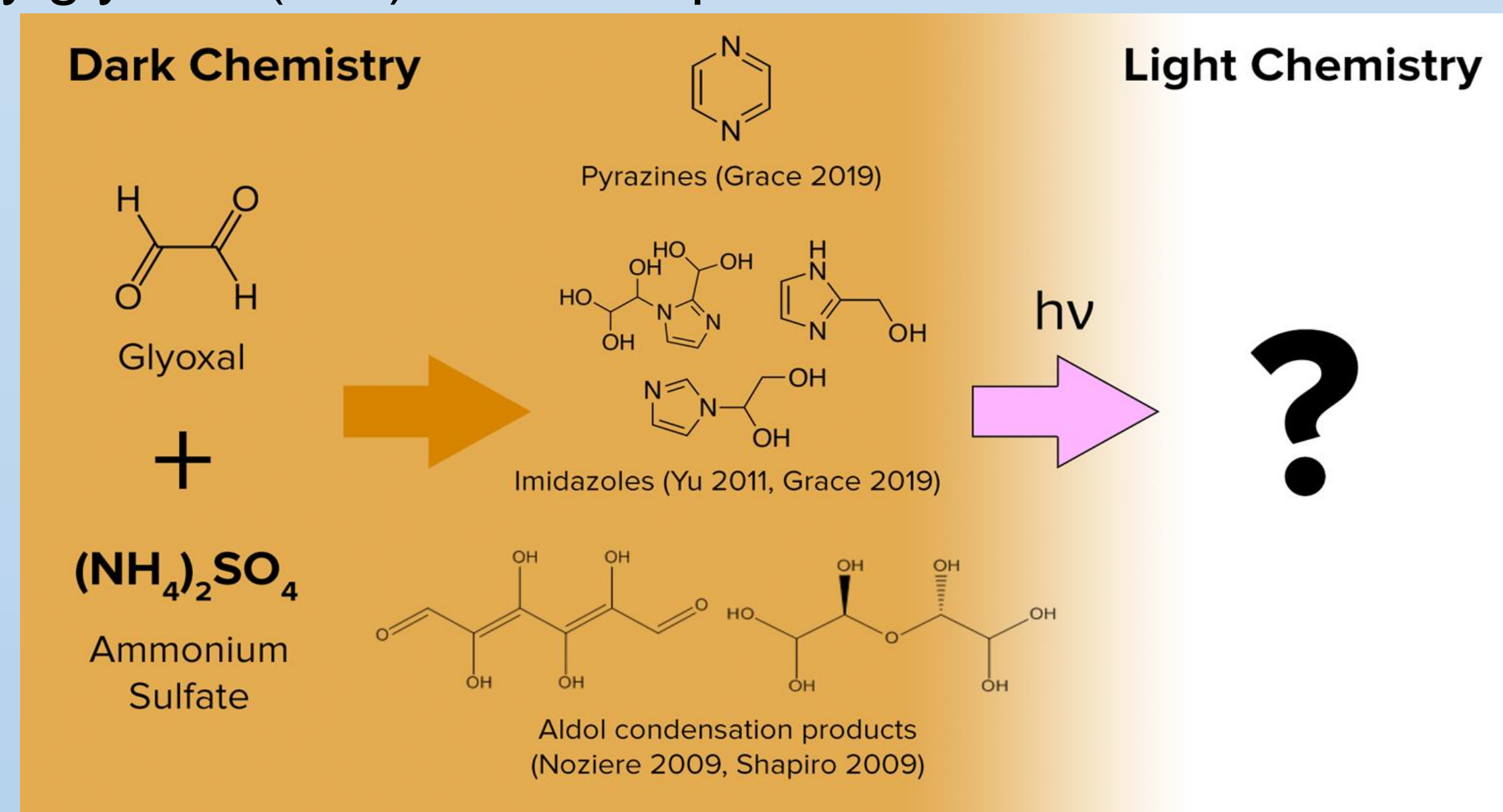
Department of Chemical and Biomolecular Engineering<sup>1</sup> and Department of Chemistry<sup>2</sup>, Lafayette College, Easton PA

## Introduction

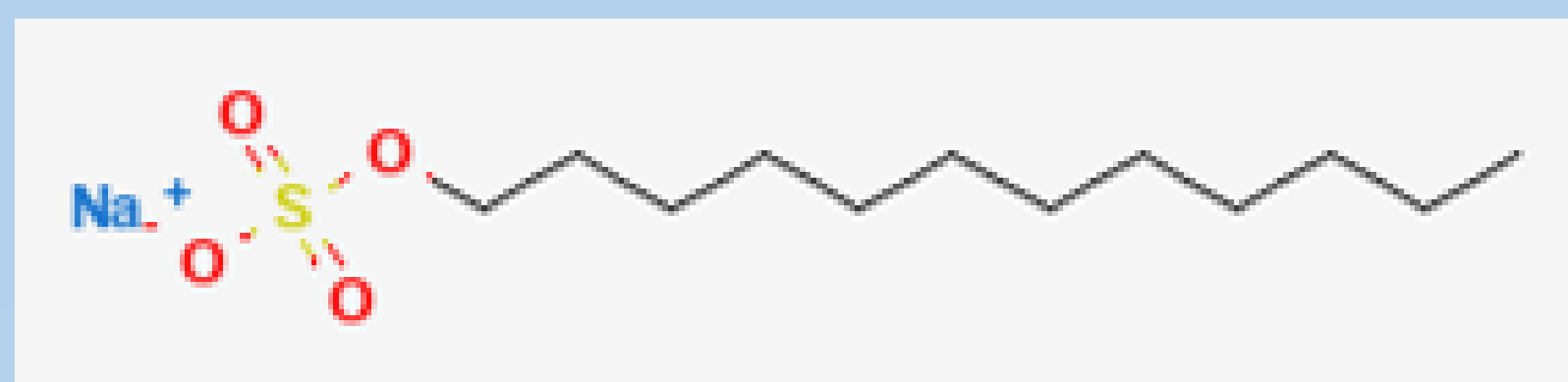
- Secondary organic aerosol (SOA) are formed via in situ interactions with volatile organic compounds (VOCs)
- Our work has shown that when exposed to UV light Methyl/glyoxal (MG) surface tension changes as a function of time
- The main goal was to analyze the effects of irradiation on Glyoxal (G) and 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 Volatile Organic Compounds

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

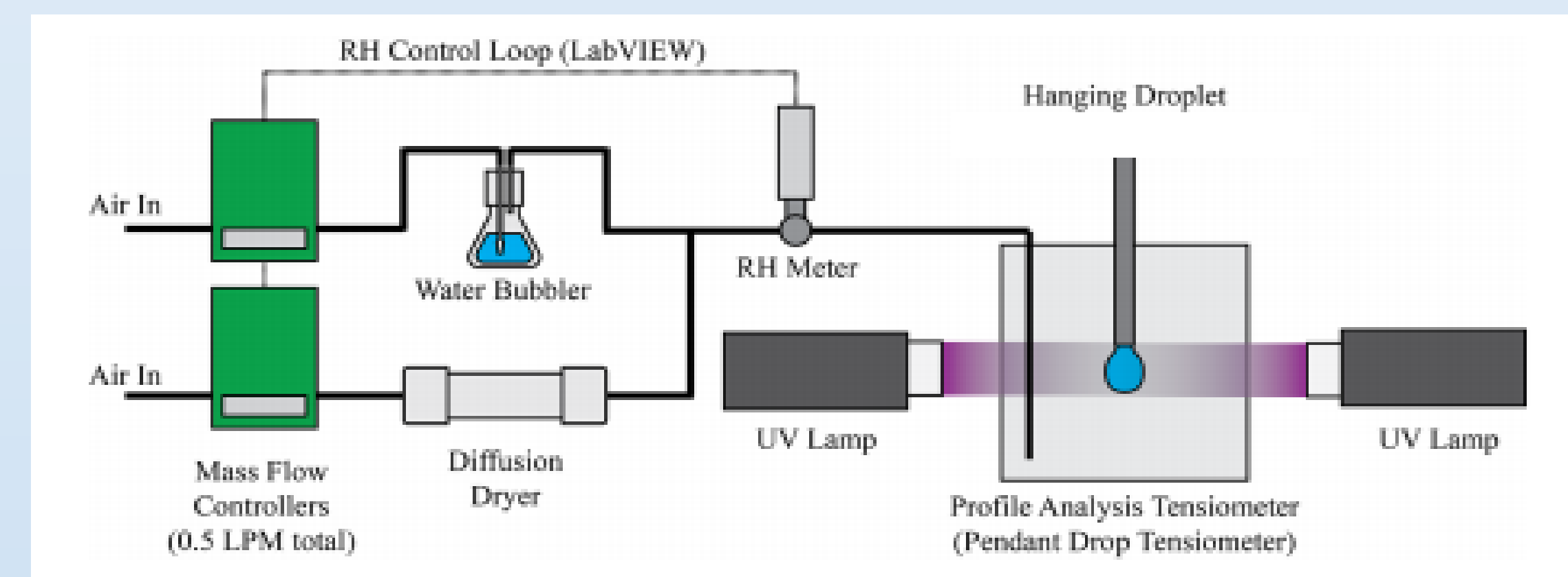


**Figure 1:** Graphical representation of dark chemistry occurring with the mixture of G and AS. It produces pyrazine and imidazole which are known to absorb UV radiation. Currently not much is known of the product when exposed to UV<sup>1</sup>



**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



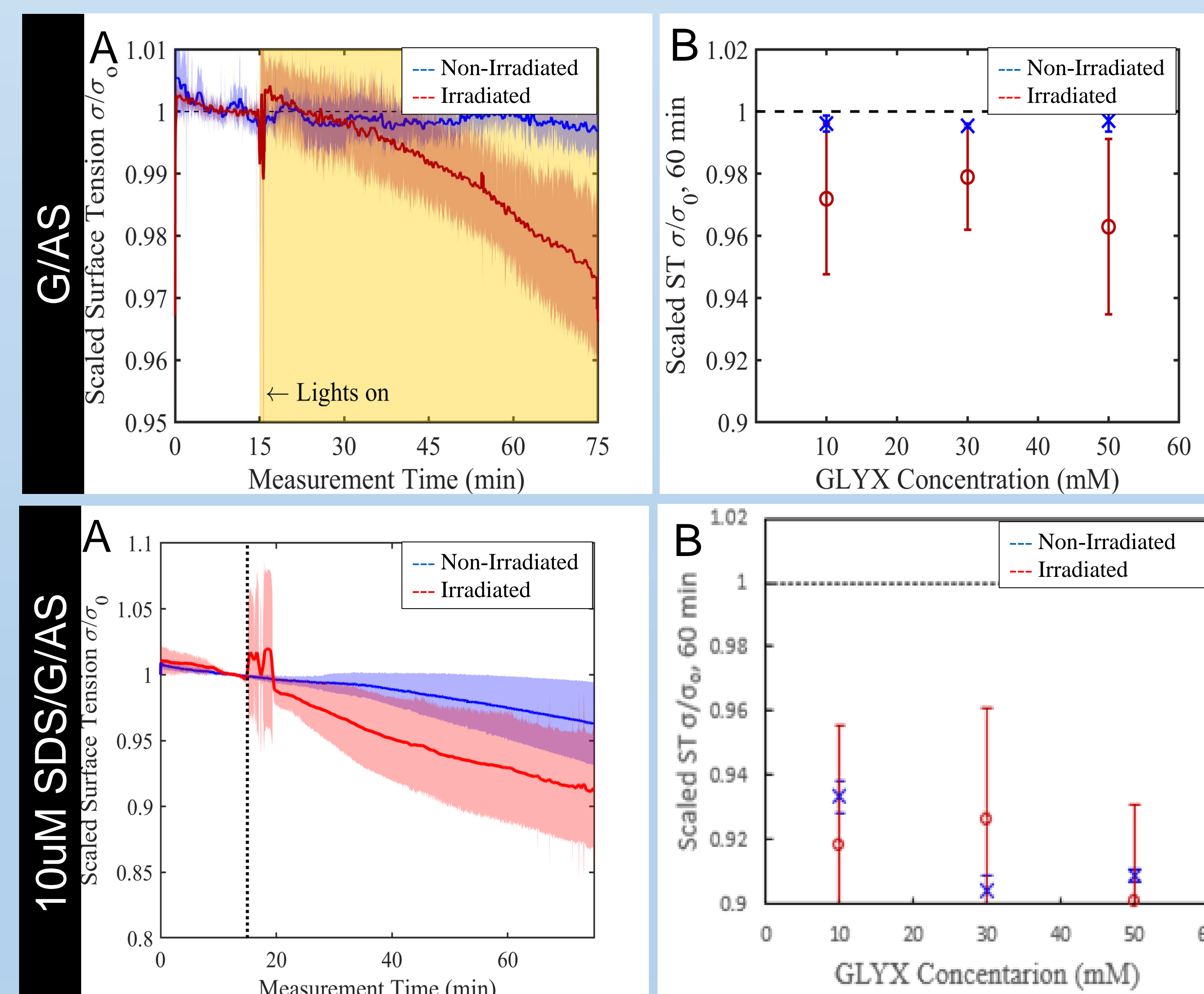
**Figure 3:** Schematic of Profile Analysis Tensiometer (PAT) experimental set up<sup>2</sup>

- 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.

In the table below shows the calculated p-value to the 95% CI for each experimental condition performed

	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

**Table 1:** An ANOVA analysis on the data. In both testing condition 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.