Progress Report to the New York Wine and Grape Foundation

Project funded in 2019-20

STUDIES PERTAINING TO ENOLOGY; WINE AND HEALTH; AND GRAPE JUICE AND HEALTH STUDIES

Title: Defining appropriate free and molecular SO_2 limits for wine packaged in aluminum cans

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Objective:

Wines packaged in aluminum cans ("canned wine") are one of the fastest growing segments of the wine industry, including the NY State industry. However, canned wines are at greater risk for developing 'reduced' aromas due to formation of H_2S ("rotten egg"). Existing literature suggests that SO_2 may be the source of this H_2S, and beverage can manufacturers offer general guidelines for maximum free or total SO_2. However, the applicability of these guidelines for a broad range of wines (e.g. those from NY State) are unclear, in part because its is unclear if free or molecular SO_2 is responsible for formation of H_2S.

Our specific objective is to "Determine if molecular and free SO_2 is responsible for H_2S production during canned wine storage, and define appropriate limits for the relevant SO_2 species"

The expected outcome of this work is improved quality control of wines by New York State winemakers. This proposal fulfils several of the stated priorities of the 2019-20 NYWGF Request for Proposals, particularly research on "Sulfur like off-aromas".

Progress towards Objective

Wines packaged in aluminum cans ("canned wines") represent the fastest growing packaging segment in the wine industry, with 60% year-over-year growth reported recently by Nielsen. Several New York State wineries have joined in this growth, and now offer canned wines. Canned wines offer several advantages including ease of shipping, convenience, and recyclability. However, one concern associated with canned wines is the potential for developing sulfur like off-aromas (SLOs, also called "reduced aromas") due to production of H_2S ('rotten egg' aroma).
Although wine and model wine solutions containing SO_2 are well known to result in H_2S formation (Mrak, et al 1937 J Food Sci; Rankine, 1983 Austr. Grape. Wine.), it is unclear if the free or molecular SO_2 fraction is responsible (Figure 1). This lack of knowledge limited winemakers' ability to tune their wines to minimize the chance of H2S formation during can storage.

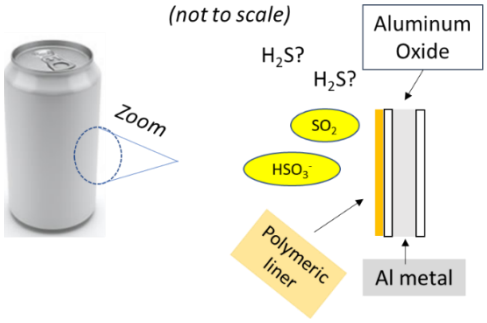

Figure 1 – Aluminum beverage can (left), with a cartoon of the interior liner shown (right). We hypothesize that the neutral, "molecular" form of SO_2 will penetrate the can liner to react with aluminum oxide, and eventually Al metal, to generate H_2S.

We hypothesized that H_2S is formed during aluminum can storage following molecular SO_2 diffusion through the resin liner and the passive layer on the surface of the Al metal. To evaluate this hypothesis, we incubated aluminum coupons in model wine systems with varying SO_2 concentrations under accelerated conditions. Ethanol and pH were manipulated to control the ratio of molecular to free SO_2. Preliminary data indicate that molecular SO_2 is a better predictor of H_2S evolution. We are now expanding on this work with real wine systems and a broader range of aluminum coatings.

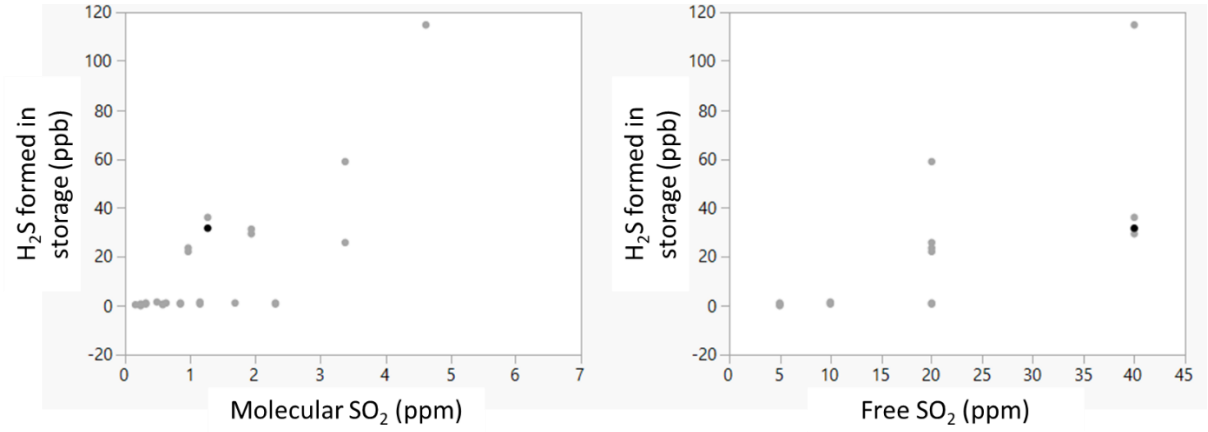

Figure 2 – Preliminary data, showing H_2S evolution in model wine systems as function of varying molecular SO_2 (left) and free SO_2 (right), stored in the presence of Al coupons. The stronger correlation was observed for molecular SO_2.