



## Cleaning of Acrylic Painted Surfaces

July 12 – 15, 2016

The John and Mable Ringling Museum of Art  
Sarasota, Florida

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**SESSION TITLE:** The Just and True Formulation of Emulsions Using Pemulen TR2

**INSTRUCTOR:** Chris Stavroudis

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### ADDITIONAL NOTE

Xanthan gum can replace Pemulen TR2 as a gelling and emulsifying agent in many if not all uses. Xanthan gum can be used at all pHs and doesn't require the elaborate procedure described below to set the pH of the stock gel. As yet we don't know if there is a difference in performance between a gel or emulsion system based on Xanthan or Pemulen. For this reason, the preparation of Pemulen stock gels is given below.

### TECHNICAL NOTE

Preparation of Pemulen TR2 Stock gels for use with the MCP (200% working concentration)

Prepare stock gel at pH 6.0 and 6.5.

Once diluted to 1%, any solvent that is not water-miscible can be emulsified into the base gel.

pH 6.0: Suspend 4g Pemulen TR2 into 100 mL distilled or deionized water, stir until uniform and well dispersed. Dissolve 4.5g (4.0 mL) triethanolamine into 95 mL water. With vigorous stirring, mix the Pemulen suspension with the TEA solution. Using the procedure below, adjust to pH 6.0 with additional TEA or additional Pemulen suspension; and bring final volume to 200 mL.

pH 6.5: Suspend 4g Pemulen TR2 into 100 mL distilled or deionized water, stir until uniform and well dispersed. Dissolve 5.0g (4.5 mL) triethanolamine into 95 mL water. With vigorous stirring, mix the Pemulen suspension with the TEA solution. Using the procedure below, adjust to pH 6.5 with additional TEA or additional Pemulen suspension; and bring final volume to 200 mL.

To measure the pH of a Pemulen gel, remove a small amount of the gel (about 5 grams) and dilute with distilled or deionized water (about 20 mL) until the solution is a thick, evenly dispersed liquid (about ½% Pemulen). Check the pH with pH paper. If the pH is low, add a bit more of the base, TEA for pHs less than 8.0, 10% NaOH for pH 8.0 and 8.5. If the pH is too high, add additional Pemulen suspension, mix well, and repeat the testing process. Note that the Pemulen is not completely reacted with the base(s) for a day or two after mixing. At that point there should be no lumps remaining in the gel.

To prepare the 1% working solution dilute the stock Pemulen gel 1:1 with other aqueous preparations. If diluting the stock gel with a single concentrated stock solution from the MCP, for each 5 mL of stock Pemulen, add 2 mL of concentrated MCP solution and 3 mL water. If adding two MCP components, add 2 mL of each MCP solution and 1 mL water to the 5 mL of stock Pemulen gel. I find that a small, wide mouth "ointment" jar placed on a magnetic stirrer works wonders for dispersing the thick



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## Technical Note cont'd.

Pemulen stock gel in the aqueous solution – break up the big lump with a spatula first and then give it a few minutes stirring. You may want to tape the jar to the stirrer since, as the viscosity increases, the stirrer may start spinning the jar as well.

To use your Pemulen TR2 to make an emulsion:

Take a small amount of the 1% working Pemulen gel and place in a jar. Add any non-water soluble solvent and shake. It should instantly form a stable emulsion. (Even better, stir on a magnetic stirrer until a smooth, creamy emulsion has formed.) 2% benzyl alcohol in the Pemulen is an excellent starting point for testing the emulsion. Pemulen TR2 can make stable emulsions with as much as 30%, and sometimes more, added solvent by volume.

Pemulen is a non-volatile material. Rinse with pH adjusted water at the same pH.



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