Cleaning of Acrylic Painted Surfaces
Washington DC, April 30 – May 3, 2013

TITLE

pH Adjusted Water Recipes

INSTRUCTOR

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TECHNICAL NOTE

INTRODUCTION

The following pH adjusted aqueous rinse solutions are made with acetic acid and ammonium hydroxide because both the acid and base components are volatile and will leave no residue on the paint surface. By setting the pH and the ionic strength (conductivity) we have controlled the intrinsic properties of the water.

These recipes allow you to prepare the rinsing solutions at their listed pH and with the stated conductivity. Absent a conductivity meter, diluting the solution to the stated final volume will yield a solution sufficiently close to the stated conductivity. All that is required is a pH meter to set the solution to the appropriate pH. Glacial acetic acid is pure (100%) acetic acid. (It's called glacial because on a cold morning in an unheated lab it will begin to freeze and form large chunks of solid acetic acid floating in the remaining liquid.)

6,000µS/cm

pH 5.0

1mL Glacial Acetic Acid in 100 mL distilled or deionized water
Set pH to 5.0 with 10% Ammonium Hydroxide (approximately 8mL)
Dilute to a final conductivity of 6,000µS or
Dilute to 125 mL final volume if you don't have a conductivity meter.

pH 5.5

1mL Glacial Acetic Acid in 100 mL distilled or deionized water
Set pH to 5.5 with 10% Ammonium Hydroxide (approximately 10mL)
Dilute to a final conductivity of 6,000µS or
Dilute to 160 mL final volume if you don't have a conductivity meter

pH 6.0

1mL Glacial Acetic Acid in 100 mL distilled or deionized water
Set pH to 6.0 with 10% Ammonium Hydroxide (approximately 11mL)
Dilute to a final conductivity of 6,000µS or
Dilute to 170 mL final volume if you don't have a conductivity meter

pH 6.5

1mL Glacial Acetic Acid in 100 mL distilled or deionized water
Set pH to 6.5 with 10% Ammonium Hydroxide (approximately 12mL)
Dilute to a final conductivity of 6,000µS or
Dilute to 175mL final volume if you don't have a conductivity meter

Generally speaking, we want to keep the ionic strength of clearance solutions high when working with acrylic paint surfaces. The following solutions with conductivities of 1,000µS/cm can be mixed 4 parts 1,000µS/cm pH adjusted water to 1 part sodium sulphate stock solution to create a 6,000µS/cm rinse solution that has elevated sulphate ion to supress the solubility of nonionic surfactants and cellulose ethers by lowering their cloud points.

1,000µS/cm

pH 5.0

1mL Glacial Acetic Acid in 1 L distilled or deionized water
Set pH to 5.0 with 10% Ammonium Hydroxide (approximately 8mL)
Dilute to a final conductivity of 1,000µS or
Dilute to 1,600 mL final volume if you don't have a conductivity meter.

pH 5.5

1mL Glacial Acetic Acid in 1 L distilled or deionized water
Set pH to 5.5 with 10% Ammonium Hydroxide (approximately 10mL)
Dilute to a final conductivity of 1,000µS or
Dilute to 1,600 mL final volume if you don't have a conductivity meter

pH 6.0

1mL Glacial Acetic Acid in 1 L distilled or deionized water
Set pH to 6.0 with 10% Ammonium Hydroxide (approximately 11mL)
Dilute to a final conductivity of 1,000µS or
Dilute to 1,800 mL final volume if you don't have a conductivity meter

pH 6.5

1mL Glacial Acetic Acid in 1 L distilled or deionized water
Set pH to 6.5 with 10% Ammonium Hydroxide (approximately 12mL)
Dilute to a final conductivity of 1,000µS or
Dilute to 2,000 mL final volume if you don't have a conductivity meter

pH 7.5

1mL Glacial Acetic Acid in 1 L distilled or deionized water
Set pH to 7.5 with 10% Ammonium Hydroxide (approximately 12.5mL)
Dilute to a final conductivity of 1,000µS or
Dilute to 1,900 mL final volume if you don't have a conductivity meter

pH 8.5:

1mL Glacial Acetic Acid in 1 L distilled or deionized water
Set pH to 8.5 with 10% Ammonium Hydroxide (approximately 14mL)
Dilute to a final conductivity of 1,000µS or
Dilute to 3,000 mL final volume if you don't have a conductivity meter

The pKa of acetic acid is 4.756 and the pKa of ammonium hydroxide is 9.25 so the pH 5.0 and 5.5 solutions will be buffered by the acetic acid/acetate ion equilibrium and the 8.5 solution will be buffered by the ammonium hydroxide/ammonium ion equilibrium. The other solutions will be pH adjusted but will have no buffering capacity.