Comparison of Microplate Sealing Tapes Using Standardized Test Protocols

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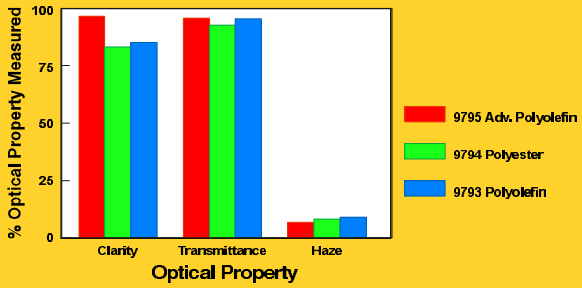
Abstract

Adhesive tapes have become an attractive option to cover microplates in bioanalytical, genomic, and pharmaceutical research. Primary performance criteria for microplate adhesive tape seals include: prevention of evaporation from the individual wells; low contamination of well contents by the tape adhesive; prevention of cross-contamination between individual wells, and clean tape removal for access to the well contents. Depending on the particular research objective, other criteria for adhesive tape seals may be important. These include pierce-ability for access to individual wells without entire tape removal, good optical properties for monitoring well contents through the tape, and temperature resistance over wide ranges to include compound storage and PCR.

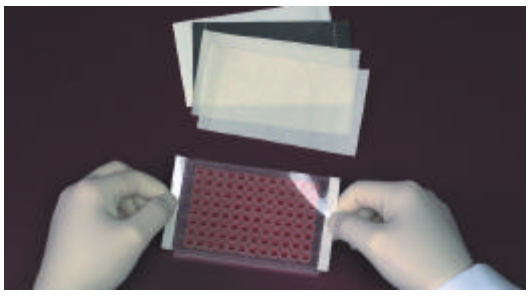
This poster will describe results of a wide variety of adhesive tape performance testing designed to mimic actual industry use conditions. The tests include evaporation data with water, DMSO, and aqueous mixtures of isopropanol, methanol, and acetonitrile. Microplate composition and manufacturer were also varied. Temperature conditions ranging from -70° C up to room temperature and actual PCR cycling were evaluated. Other testing results on adhesive extractables, tape optical properties, and tape application and removal will be presented.

Optical Properties



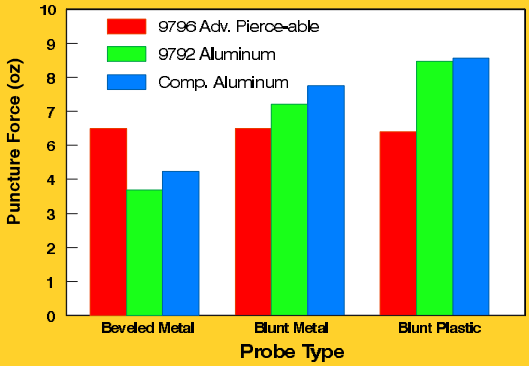
PCR Compatibility

- Solvent loss after typical cycle < 5% with no dry wells.
  - The following cycle repeated 35 times: 94 C for 1 min; 55 C for 1 min; 72 C for 45 sec.
- Very low autofluorescence for 9793 and 9795 polyolefin tapes.
- Adhesives do not interfere with cycle reactions.



Pierce-able Tape Properties

Force Required to Pierce Various Tapes as a Function of Probe Type



Qualitative Analysis after Repeat Piercing of 9796 Advanced Tape

	Number of Manual Piercings with a Blunt or (Beveled) Metal Probe			
Solvent in Microplate Wells	10	100	200	400
$MeOH/H_2O$	No Adhesive Residue	No Adhesive Residue	No Adhesive Residue	No Adhesive Residue Moderate Amount Adhesive Residue
Acn/H_2O	No Adhesive Residue	No Adhesive Residue Small Amount Adhesive Residue	No Adhesive Residue	No Adhesive Residue
IPA/H_2O	Small Amount Adhesive Transfer No Adhesive Residue	No Adhesive Residue	No Adhesive Residue	No Adhesive Residue Small Amount Adhesive Residue
H_2O	No Adhesive Residue	No Adhesive Residue	No Adhesive Residue	No Adhesive Residue Small Amount Adhesive Residue

Solvent Extractables

9792 Aluminum 9793 Polyolefin 9794 Polyester
9798 White Polyester

One hour direct contact between adhesive and solvent followed by overnight incubation at room temperature.

Solvents: DMSO and ethanol (80) / water (20).

Blanks, controls, and extracts were analyzed by GC/MS.

Results:

DMSO: None detected above background.
Ethanol/water: Hydrocarbon acrylate esters 5 μg /mL.
Antioxidant 630 μg /mL.

9795 Advanced Polyolefin
9796 Advanced Pierce-able

One hour direct contact between adhesive and solvent followed by twenty hour incubation at 37° C.

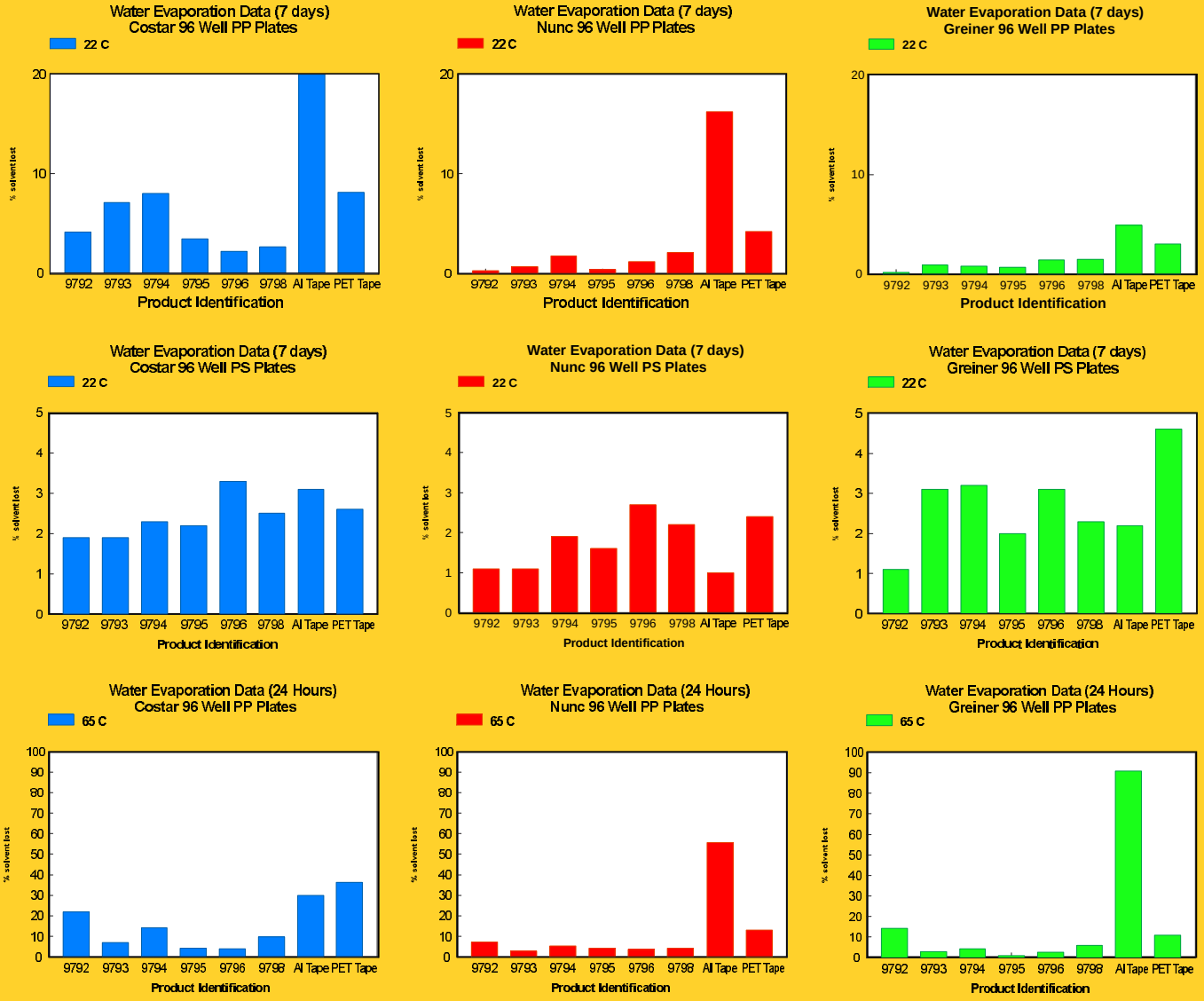
Solvents: DMSO; methanol (80) / water (20); acetonitrile (80) / water (20).

Blanks, controls, and extracts were analyzed by GC/MS.

Results:

	Compound Detected in Extract (μg /mL)		
Extract Solvent	Siloxanes	Antioxidant	Other unidentified
DMSO	30	<0.5	<0.5
Acn / H_2O	60	<0.5	<0.5
$MeOH / H_2O$	40	<0.5	<0.5

Prevention of Water Evaporation



3M™ Microplate Sealing Tapes

3M Aluminum Microplate Sealing Tape 9792

Single coated tape consisting of a 1.5 mil dead soft aluminum coated on one side with a pressure sensitive acrylate adhesive. The tape is supplied on a brown paper release liner.

3M Polyolefin Microplate Sealing Tape 9793

Single coated tape consisting of a 2.0 mil polyolefin film coated on one side with a pressure sensitive acrylate adhesive. The tape is supplied on a white paper release liner.

3M Polyester Microplate Sealing Tape 9794

Single coated tape consisting of a 2.0 mil polyester film coated on one side with a pressure sensitive acrylate adhesive. The tape is supplied on a white paper release liner.

3M Advanced Polyolefin Microplate Sealing Tape 9795

Single coated tape consisting of a 2.0 mil clear polyolefin film coated on one side with a clear pressure sensitive silicone adhesive. The tape is supplied on a white polyester release liner.

3M Advanced Pierce-able Microplate Sealing Tape 9796

Single coated tape consisting of a 2.0 mil pierce-able polyethylene film coated on one side with a clear pressure sensitive silicone adhesive. The tape is supplied on a white polyester release liner.

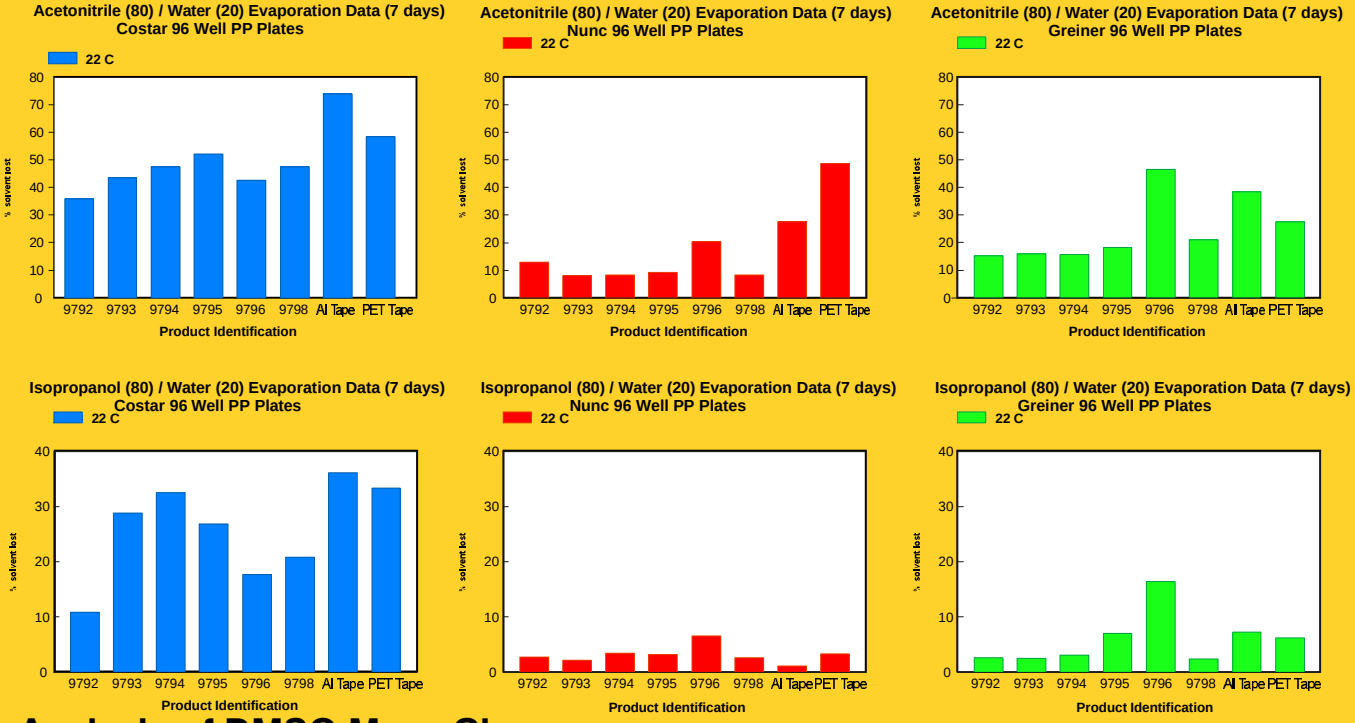
3M White Polyester Microplate Sealing Tape 9798

Single coated tape consisting of a 2.0 mil white polyester film coated on one side with a pressure sensitive acrylate adhesive. The tape is supplied on a white paper release liner.

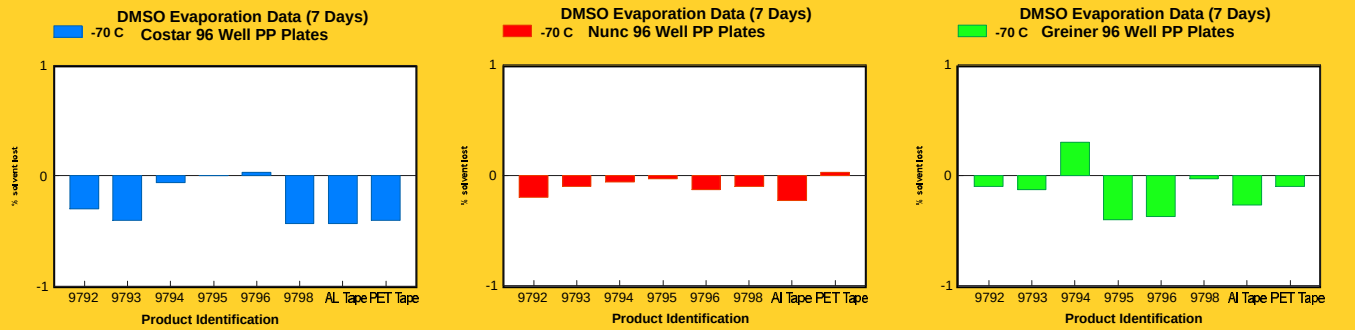
3M Microplate Sealing Tape Applicator 9799

Rectangular shaped, hand held applicator made of polyester. The applicator is gold color.

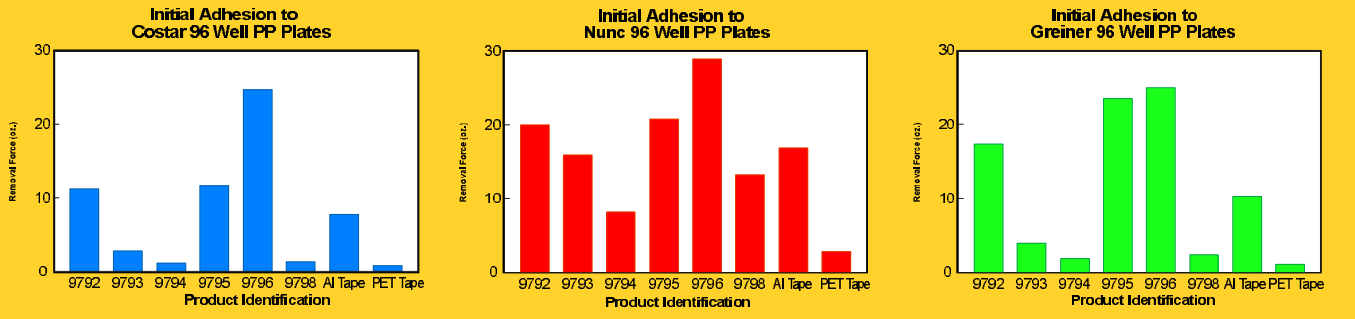
Prevention of Aqueous / Organic Solvent Evaporation



Analysis of DMSO Mass Change



Sealing Tape Adhesion to Polypropylene Microplates



Conclusions

1. Choosing the appropriate sealing tape is dependent on the total system being utilized - tape, plate, and application must be considered.
2. Test methods have been developed to aid in making the best sealing tape selection.