FAMILY OF REVITAL-OX™ ENZYMATIC DETERGENTS
SUBSTRATE COMPATIBILITY WITH COMMON ENDOSCOPE MATERIALS

PURPOSE
The purpose of this study was to determine the compatibility of the family of Revital-Ox Enzymatic Detergents with a variety of materials (substrates) commonly used in the manufacture of endoscopes.

Included in this compatibility testing are the following products:
- Revital-Ox™ 2X Concentrate Enzymatic Detergent (2D99)
- Revital-Ox™ Dye and Fragrance Free Enzymatic Detergent (2D97)
- Revital-Ox™ Enzymatic Detergent with Color and Fragrance (2D96)
- Revital-Ox™ PowerLift Cleaning Technology Enzymatic Detergent (2D98)

METHODS

Non-Metals
To simulate worst-case conditions, the family of Revital-Ox Enzymatic Detergents was used at twice the upper limit of the recommended use-dilution (range of 1/8-1/2 oz./gal. or 1-4 mL/L) and the exposure time and temperature were exaggerated compared to typical use-dilution conditions. Coupons representing 20 non-metal endoscope substrates were subjected to static immersion in a 1 oz./gal. (8 mL/L) use-dilution of each Revital-Ox Enzymatic Detergent for 48 hours at 50°C (122°F). Following the testing phase, the coupons were cleaned, patted dry and allowed to completely dry for 24 hours. The coupons were evaluated for weight loss or gain and examined for physical changes such as discoloration, clouding, blistering, tackiness and swelling. Coupons were also placed in tap water (negative control) under the same test conditions.

Metals
The family of Revital-Ox Enzymatic Detergents was also tested for compatibility with eight metallic endoscope substrates under the same exaggerated conditions. Coupons representing the metal substrates were evaluated by determining the corrosion rate. The corrosion rate is expressed as mils per year (mpy) based on weight loss, after 48 hours of static immersion in a 1 oz./gal. (8 mL/L) use-dilution of each Revital-Ox Enzymatic Detergent at 50°C (122°F). Following the testing phase, the coupons were cleaned, patted dry and allowed to completely dry in a desiccator. The coupons were then visually examined for signs of corrosion or pitting and weighed. The corrosion rate was calculated based on the weight loss data. Coupons were also placed in tap water (negative control) under the same test conditions.

RESULTS

Non-Metals
Under static immersion conditions of the family of Revital-Ox Enzymatic Detergents, all substrates exhibited less than 1.0% weight gain/loss or were equivalent to water alone. Visual inspection of the coupons revealed no unusual effects for all substrates.
The family of Revital-Ox Enzymatic Detergents are compatible with the following substrates:

Polyoxymethylene (Delrin® 1)
Ethyl Vinyl Acetate (EVA)
Glass
Elastomers (Kraton® 3)
Nylon
Polychloroprene (Neoprene)
Polycarbonate
High Density Polyethylene (HDPE)
Polyphenyl Sulfone (Radel® R4)  
Polycarbonate (Lexan® 2)
Polyetherimide (Ultem® 10002)
Poly (methyImethacrylate) (PMMA)
Polyphenylene oxide (Noryl® 2 - two types)
Polypropylene
Polyethylene
Polyurethane
Polyvinyl Chloride (PVC)
Silicone Rubber
Polytetrafluoroethylene (Teflon® 1)

Metals
Visual inspection of the coupons revealed no unusual effects for all metallic coupons including some select soft metals such as brass, copper, aluminum and anodized aluminum. The corrosion rates for all metallic substrates were less than one mpy.

The family of Revital-Ox Enzymatic Detergents are compatible with the following metallic substrates:

Stainless Steel 306L
Stainless Steel 304
Stainless Steel 410
Titanium alloy (Ti Gr5 6A1 4V)
Copper (CDA 110)
Brass (CDA 443)
Anodized Aluminum (AL 1100AN)
Aluminum (AL 1100)

CONCLUSION
The family of Revital-Ox Enzymatic Detergents are compatible with all of the listed substrates tested under extended exposure conditions.

REFERENCES
Data on file

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1. Delrin® and Teflon® are registered trademarks of E. I. DuPont De Nemours and Company.
2. Ultem®, Lexan® and Noryl® are registered trademarks of SABIC Innovative Plastics IP BV
3. Kraton® is a registered trademark of Kraton Polymers U.S. LLC.
4. Radel® is a registered trademark of Solvay Advanced Polymers LLC.

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