ELSA SCHIAPARELLI'S PRESSING BUTTONS:

The Scientific Assessment and Material Study of Synthetic Fasteners

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1. INTRODUCTION

Plastic artifacts are found in contemporary art and design collections, however fashion collections often house the largest variety of polymers. During the past two years, the Costume Institute completed one of the largest plastic surveys in its history. Over 100 objects were analyzed using portable non-invasive external reflection- Fourier transform infrared spectroscopy (ER-FTIR), benchtop micro-FTIR, micro-attenuated total reflection-FTIR (micro-ATR-FTIR) and separation techniques of gas chromatography-mass spectrometry (GC-MS).

The identification of the chemical composition of each plastic with their aging behaviors and degradation patterns enabled us to make informed decisions on long-term storage of the object analyzed. The variety of the collection, which includes composite objects with plastic fasteners, as wellas fans, handbags, eyewear, belts, jewelry, shoes, among others, also translate to a corresponding multitude of materials. The idea of fashion is broad enough that designers can essentially make whatever they want out of whatever they want, sometimes making conserving these objects very challenging.

Within the larger survey, we focused on a group of 26 composite objects. Exemplifying the breadth of materials and conservation challenges are plastic fasteners designed by Elsa Schiaparelli, a revolutionary in her field and early adopter of plastic materials, whose groundbreaking designs continue to influence the art and fashion world today. Her innovative applications of plastics and synthetic polymers to her design is exemplified in the following examples.

2. METHODS

UV

Reskolux UV 365 portable flashlight

Macro-Imaging

Dino-lite Edge digital microscope
Olloclip portable 3-in-1 microscope

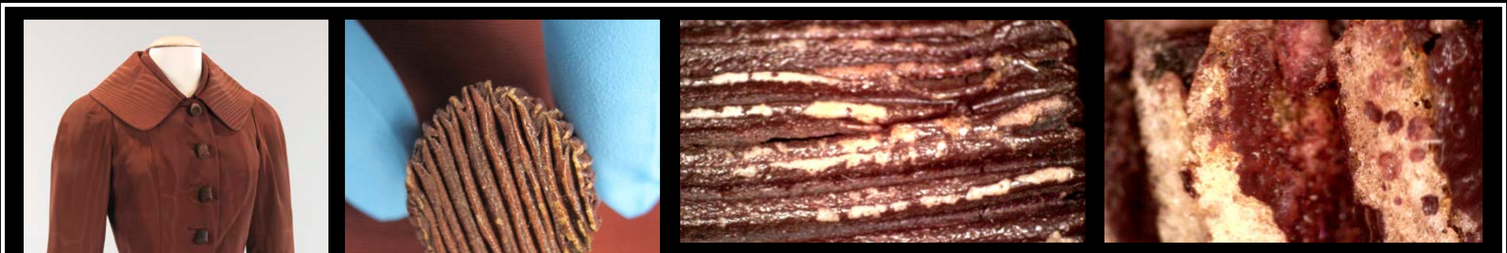
FTIR Spectroscopy

Portable: Alpha II FTIR with reflectance module (Bruker Optics)
Detector: DTGS. Acquisition: 7000 – 375 cm^{-1}, 64 scans
Benchtop: Hyperion 3000/ Tensor 27 / MCT detector
Acquisition: 4000 – 550 cm^{-1}, 64 scans

Pyrolysis-Gas Chromatography/ Mass Spectrometry (py-GC/MS)

GC8890/5977B MSD (Agilent Technologies);
Multi-Shot Pyrolyzer 3030D (Frontier Lab); 550°C or 600°C pyrolysis temperature
GC Column: J&W DB-5MS (30 m x 0.25 mm x 0.25 μm)
Sample size: 30 – 100 μg

3. RESULTS / ASSESSMENTS

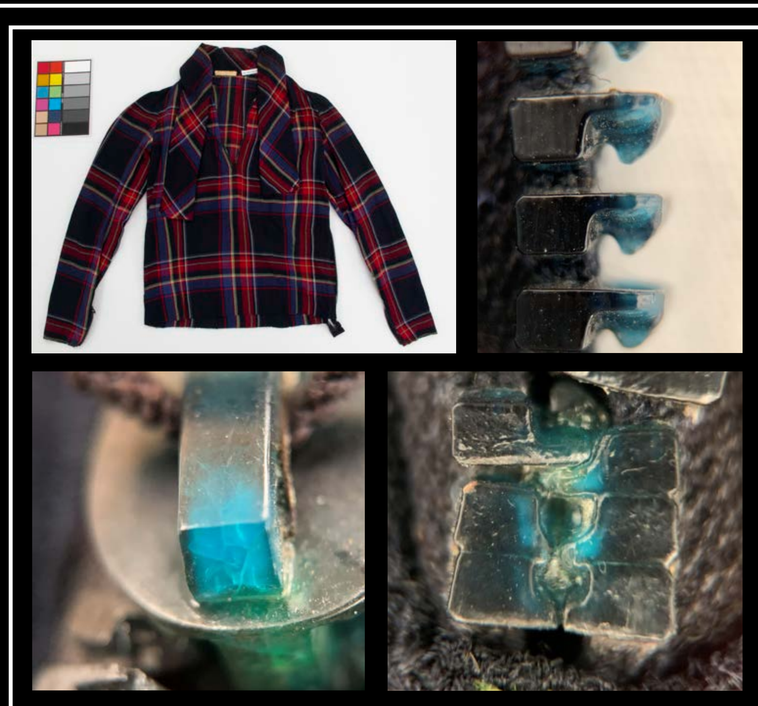


COATING ABRASION (CELLULOSE NITRATE PAINT)

Left: Elsa Schiaparelli, Jacket, French, 1934, 2009.300.152a, b.
Left Center: Button detail.
Right Center: Micro digital image of composite wood substrate and brown pigmented cellulose nitrate paint.
Right: Micro digital image of the button substrate and flaking brown pigmented cellulose nitrate paint and clear glossy cellulose acetate underlayer. (ER-FTIR, micro-FTIR)
Condition: Unstable substrate and coating
Preventive Conservation: Isolation from fabric with silicone release paper

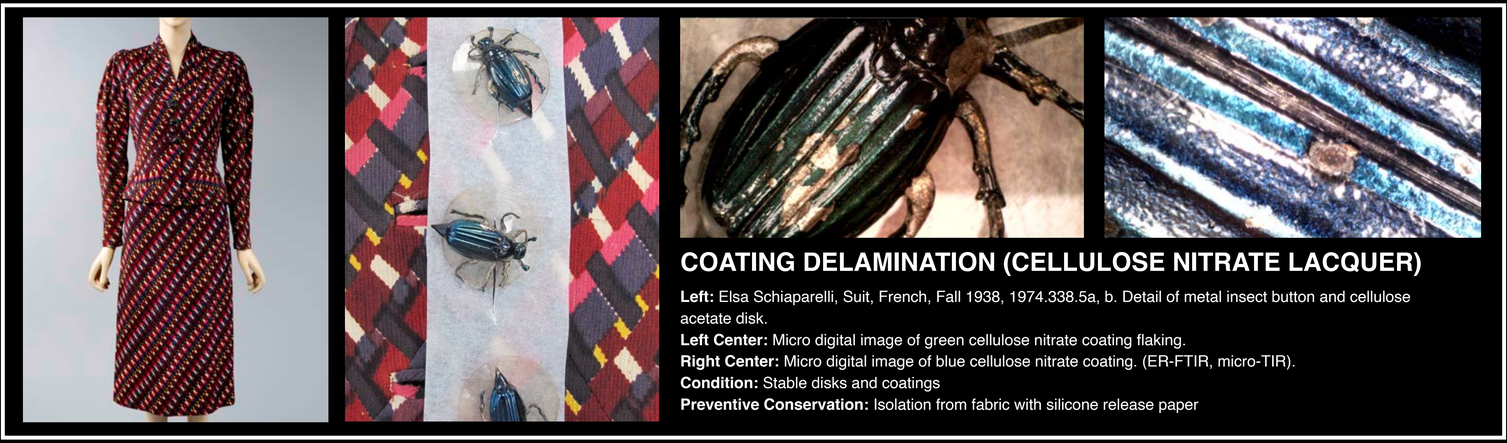
COATING DELAMINATION (CELLULOSE NITRATE PAINT) DEFECTIVE PHENOL-FORMALDEHYDE RESIN SUBSTRATE

Top Left: Elsa Schiaparelli, Evening Jacket, French, Winter 1938-39, C.I.50.34.2.
Top Right: Detail of buttons constructed of phenolic resin coated with a black pigmented cellulose nitrate paint.
Micro digital images (**Bottom Left & Right**) first button and the fourth button showing pitting due defective curing of the phenol-formaldehyde substrate. (ER-FTIR, micro-FTIR, Py-GC/MS)
Condition: Stable substrate and coating
Preventive Conservation: Not special requirements



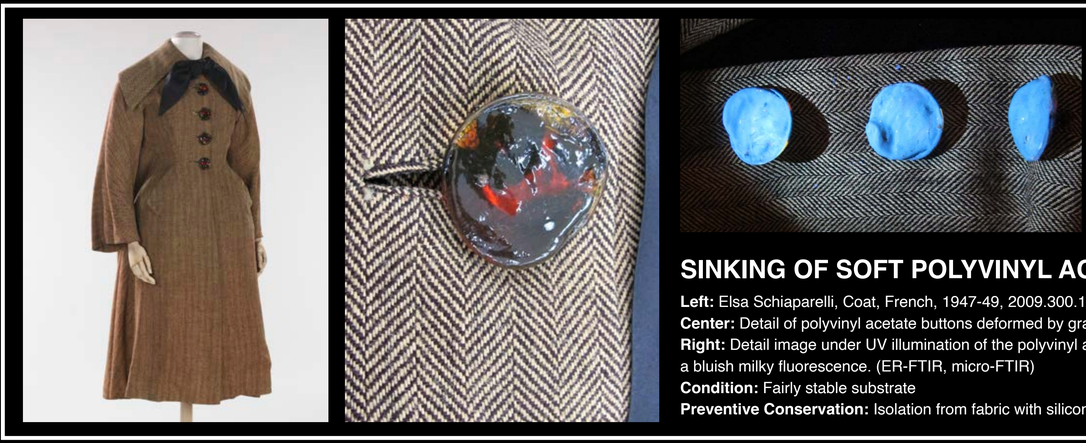
SUBSTRATE DEGRADATION (CELLULOSE NITRATE)

Top Left: Elsa Schiaparelli, blouse, French, 1936-38, 2009.300.3958.
Top Right: Internal color shift and hydrolytic breakdown in zipper body.
Bottom Left & Right: Internal color shift in the cellulose nitrate zipper body, bridge, and teeth. (ER-FTIR, micro-FTIR)
Condition: Unstable zipper teeth and pull substrate
Preventive Conservation: Hanging or flat storage and allow to ventilate.
Regular monitoring for acid off gassing



COATING DELAMINATION (CELLULOSE NITRATE LACQUER)

Left: Elsa Schiaparelli, Suit, French, Fall 1938, 1974.338.5a, b. Detail of metal insect button and cellulose acetate disk.
Left Center: Micro digital image of green cellulose nitrate coating flaking.
Right Center: Micro digital image of blue cellulose nitrate coating. (ER-FTIR, micro-TIR).
Condition: Stable disks and coatings
Preventive Conservation: Isolation from fabric with silicone release paper



SINKING OF SOFT POLYVINYL ACETATE

Left: Elsa Schiaparelli, Coat, French, 1947-49, 2009.300.137.
Center: Detail of polyvinyl acetate buttons deformed by gravity.
Right: Detail image under UV illumination of the polyvinyl acetate button, characterized by a bluish milky fluorescence. (ER-FTIR, micro-FTIR)
Condition: Fairly stable substrate
Preventive Conservation: Isolation from fabric with silicone release paper and flat storage

4. DISCUSSION AND CONCLUSIONS

Our survey has been important for the identification and study of synthetic polymers in fashion, while also increasing our understanding of Schiaparelli's material choice and design process. Schiaparelli mixed materials and experimented with their construction while creating complex and sometimes fragile objects, which require different storage and preservation solutions. Cellulose nitrate, as coatings formulations, have only suffered mechanical damage on the variety of substrate applied. However, cellulose nitrate used as molded substrate, for example in her signature zippers, is unstable.

UV illumination helped assess variability in coatings and substrate formulation, guiding sampling for analysis by benchtop techniques. Portable ER-FTIR was the most valuable screening technique to assess coating, as well as substrates compositions, when exposed, but sampling and analysis by benchtop techniques was necessary for material identification in composite layered material, as well as to evaluate the stability of the formulations.

Overall, the costume institute's plastic survey has been essential for the correct identification and study of plastic materials, so that their condition could be better assessed for appropriate storage and monitoring.

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6. REFERENCES

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