



I. Introduction

Two shoulder flaps from a Qing Dynasty ceremonial uniform (fig. 3) in the collection of the Cleveland Museum of Art (CMA) needed support forms for long term storage, as the upper edge had begun to deform under the weight of the metal decoration.

Polyethylene foams such as Ethafoam are a popular choice for creating lightweight supports, but production can be wasteful and any major mistakes may mean starting over from scratch.

Instead, a material called Formetal® Varius was explored as a potential support material, as part of a summer internship at CMA.

II. What is Formetal®?

- ❖ Formetal® Varius is a tensile-expanded aluminum metal mesh with predetermined breaking points, which can easily expand and contract along both its horizontal and vertical axes.
- ❖ The metal is flexible enough to shape by hand (though gloves are recommended), and can be cut with tin snips or scissors...
- ❖ ...but strong enough to maintain its shape, even after expansion and contraction of the network. The material can be re-worked multiple times before noticeable weakening occurs.
- ❖ Formetal® can be purchased directly from the manufacturer, Dinosaurier®³

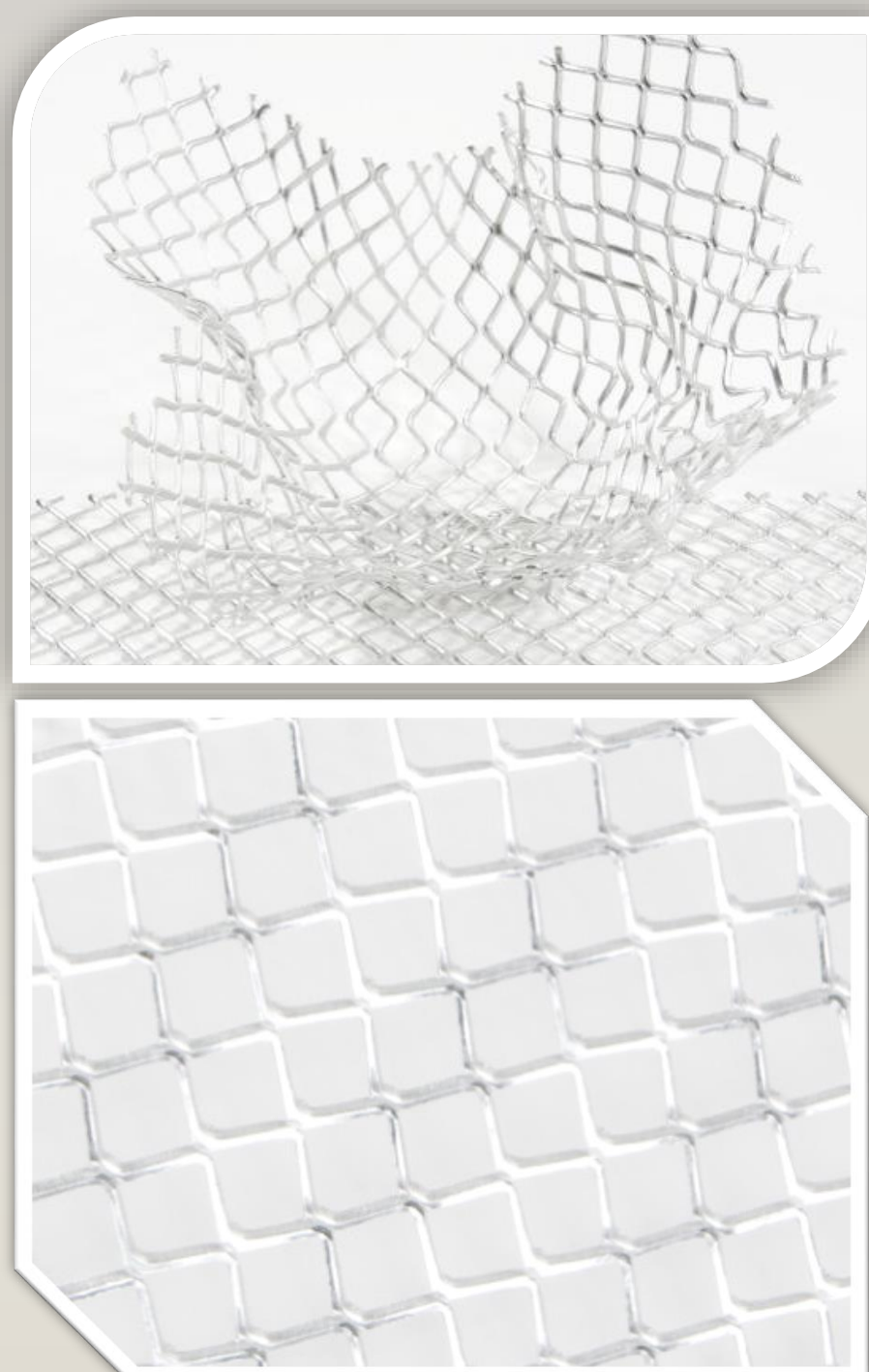


Fig 1. Examples of Formetal® Varius from the Material District website⁴.

III. Previous Versions

An earlier y-shaped version of the material called Formetal® Ypsilon has been used for select textile mounts by the Victoria & Albert Museum, London^{5,6}. This version is no longer available for purchase, but the basic composition is the same.

The promising results from the V&A projects were the inspiration for this project & poster.



Fig 2. Formetal® Ypsilon³

IV. Case Study: Supports for Qing Armor



Fig 4. Initial shaping of the Formetal® using tin snips and an archival tube.

- The Formetal® was bent and shaped by hand, crimping and removing material as needed to form the raised front edge. Fabric facsimiles developed by prior intern Sara Ludueña were used for shaping, to reduce strain on the object.
- Even small sections of Formetal® had significant strength: A strip only an inch wide was sufficient to hold the weight of the metal decorative wings.
- Finally, the completed Formetal® base was covered with medium density felt, to cover the sharp edges and provide a layer of padding.
- Further padding and show fabric layers can be easily glued or sewn on.



Fig 3. CMA 1918.560.1.d,e – Ceremonial Uniform, Left and Right Shoulder Flaps^{7,8}

As part of the authors' summer 2021 internships at the CMA, custom supports were fabricated for two armor flaps which were buckling under the weight of their metal decoration in flat storage.

- First, the Formetal® was cut roughly to size with tin snips
- The mesh was bent over an archival tube to establish the basic curvature



Fig 5, above. Checking the fit against fabric facsimiles (top), and the final custom-shaped Formetal® support form (bottom).

Fig 6, left. Final padded support form, ready for a fabric cover and storage

V. Material Testing

One caveat is that the exposed Formetal® edges are sharp and snag easily. A component of this project involved determining which readily accessible materials successfully covered and protected artifacts from the sharp edges. Mockups were created using various types and thicknesses of materials, which were glued to the mesh with low-temperature hot melt.

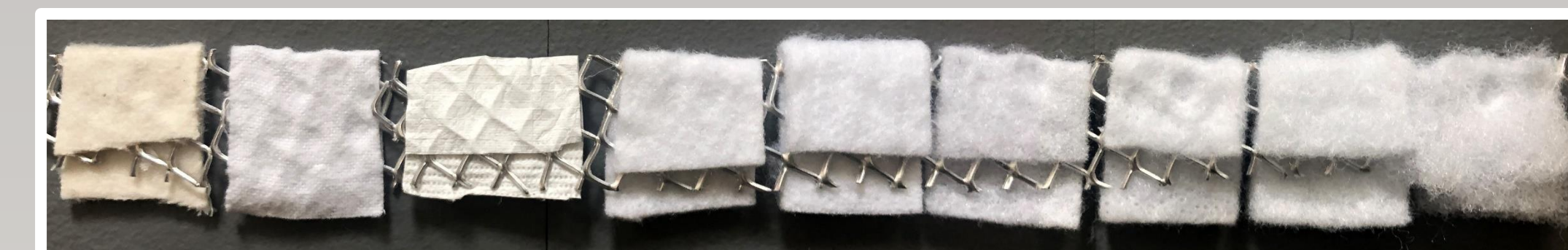


Fig 7. Strip of Formetal® with various materials attached with hot melt. From left to right: Thick cotton flannel, medium cotton flannel, Tyvek, medium felt, high density felt, thin felt, low density felt, thick high loft felt, and high loft batting.

Tyvek was sufficient for preventing snagging, but the points could still be felt through this and other thin materials. High loft and low density felts and battings were ineffective at padding or protecting the sharp edges. Dense, medium to thick felts provided the best protection, and double as a padding layer.

To ensure suitability for long-term storage, a sample of Formetal® was tested using the British Museum's 3-in-1 Accelerated Corrosion Test⁹ ("Oddy Test"). The test coupons showed no deviation from the control coupons, suggesting that Formetal® is safe for permanent use.

Follow-up analysis with DID-GC-MS confirmed a lack of plasticizers or other volatile components that would degrade over time.

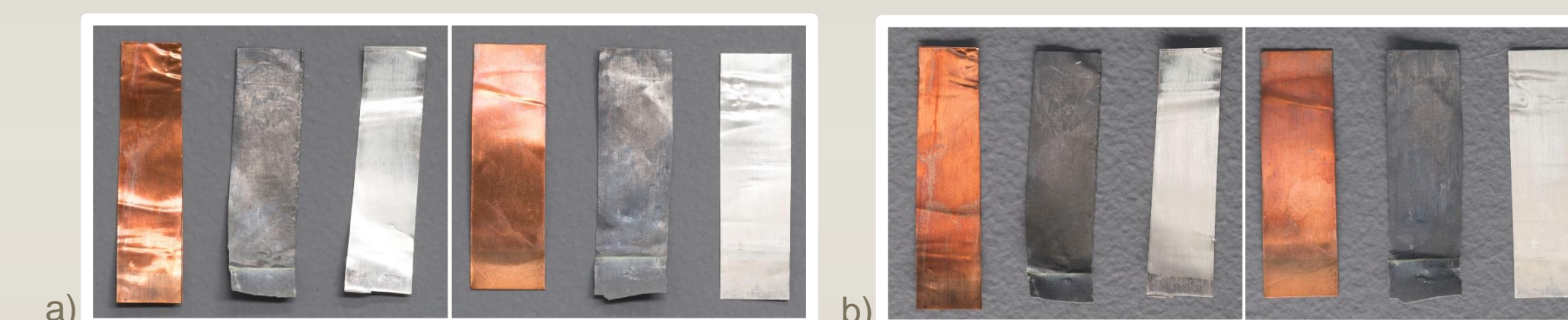


Fig 8. Control and Formetal® test coupons in diffuse normal illumination (a) and specular illumination (b). Controls are displayed on the left, tests on the right.

VI. Conclusions

Formetal® Varius is an excellent base structure for creating lightweight, sturdy, and adaptable forms, and shows significant promise as a support material for objects and textiles of all shapes and sizes.

Additionally, from an environmental standpoint this material can produce less waste during support fabrication than other mount-making materials, and any waste can be safely recycled.

Currently, large quantities of Formetal® can only be purchased from Germany, but American companies could easily source it as well with sufficient interest. At the time of this poster, a limited quantity of Formetal® Varius is available for purchase from Testfabrics, Inc. by request only – Style no. FL_608_AL.

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References

3. Formetal®. Dinosaurier-Werkzeuge. <https://www.formetal.de>
4. Formetal Varius. Material District. <https://materialdistrict.com/material/formetal-varius/>
5. Lanceley, Zoë and Murray, Roger. 2015. "Working with new materials: Mount Making with Formetal®". Poster presented at the Forum of the ICON Textile Group, in *Learning Curve: Education, Experience, Reflection*. ICON: London, UK. 87.
6. Morris, Roisin. 2018. "The Conservation of a Silk lampshade". Poster presented at the Forum of the ICON Textile Group, as part of joint presentation: "Inspired by Nature: Fabrics of the Future". In *The Nature of Textiles*. ICON: London, UK.
7. Qing Ceremonial Uniform: Left Shoulder Flap. Cleveland Museum of Art. <https://www.clevelandart.org/art/1918.560.1.d>
8. Qing Ceremonial Uniform: Right Shoulder Flap. Cleveland Museum of Art. <https://www.clevelandart.org/art/1918.560.1.e>
9. Thickett, D and Lee, L.R. "Selection of Materials for the Storage or Display of Museum Objects". *Occasional Paper*, no.11 (2014): 9-16. British Museum

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