The Japanese Namban cabinet KK 5421, at the Kunsthistorisches Museum Vienna, dated 1580-1607/11, is a typical Namban lacquer work with flat gold and silver makie and mother-of-pearl inlay on a black-lacquered ground with designs of plants, flowers and animals and gilded copper fittings. Its wooden base is probably – according to the smell – a Japanese cypress. Its conservation for the re-opening of the Kunstkammer collection in the Kunsthistorisches Museum included cleaning and consolidation with mugi-urushi, improvement of the old filling and retouching of the split on the backside with both Japanese and western materials, and the aesthetic integration of the big lacquer losses. In parallel with the conservation the analyses were performed to obtain new information about the stratigraphy and the structure of the layers to determine the composition of the lacquer and the binder of the ground.

The Tea box (9952), belonging to a private collection in Austria, is a typical Canton lacquer object from the 19th century (1820 – 1850, Qing dynasty). The box with lid contains another box made of tin, in which the tea was stored. The black lacquer surface of the outer wooden box is decorated with very fine gold and silver paintings (miaojin), depicting scenes with persons drinking, tasting and trading tea. The foundation layer taken from the edge of the top side of the Chinese lacquer tea box was analysed by both microchemical test and GC/MS. The sample was firstly treated with hydrogen peroxide and benzidine, the positive presence of blood was indicated by a blue coloration appearance. The comparison of chromatographic profiles of amino acids obtained by hydrolysis of a blood reference standard and the sample proved that the ground contains blood, and according to the literature and traditional recipes, pig blood was commonly used by Chinese lacquer artists. The investigations served to identify the materials and to plan the conservation measures.

Another exceptional piece from the same private collection is a French cabinet (M73/1) made by Jacques Dubois in Paris, around 1760. A Japanese lacquer panel is inserted in the front door. The door panels are European furniture with incorporated Japanese lacquer and a detail of Japanese panel (right). The decoration is executed with takamakie and hiramakie techniques, using different gold and silver powders and pigments. The analyses aimed to identify the composition of the ground layer to support the choice of consolidation materials as well as the composition of the varnish over the lacquer to be able to decide about the surface treatment. GC/MS investigations of the ground layer showed that it is based on animal glue. The European varnish is composed of drying oil, shellac, sandarac resin and pine resin.

### Scientific Investigation of Historic Asian Lacquer Works of Art

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From the sixteenth century onwards collecting Asian artefacts has been fashionable among European aristocratic houses since the Portuguese and later the Dutch and the English obtained a monopoly for trading with China and Japan, where lacquer has been used for thousands of years as a durable and beautiful coating material. As European imitations and replicas were produced later, it has always been fundamental for assigning the provenance of these objects to accurately define not only the coating technique, but also the composition of the surface varnishes and lacquers as well. According to the provenance, the objects can be divided into three groups: Japanese, Chinese, and European origin, respectively. Examinations of the lacquer objects revealed that in addition to Asian lacquers a variety of other materials were used to obtain a durable lacquer layer. Diverse drying oils, proteinaceous or polysaccharide based materials applied as organic binding media – together with various substrates and pigments – were identified when studying the grounds, lacquer layers or upper coatings. Combining optical microscopy and GC/MS is an appropriate analytical approach to detect and identify such complex organic mixtures.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ground layer thick tan-grey ground layer with coarse particels (white, yellow, red and black),</td>
<td>(1)</td>
</tr>
<tr>
<td>2</td>
<td>black outline dark thin layer1, carbonic</td>
<td>(2)</td>
</tr>
<tr>
<td>3</td>
<td>lower lacquer thin layer, UV-fluorescence like milk coffee</td>
<td>(3)</td>
</tr>
<tr>
<td>4</td>
<td>red size red layer, dark and brighter red particels, inhomogeneous, iron oxide (XRF)</td>
<td>(4)</td>
</tr>
<tr>
<td>5</td>
<td>gold layer of gold powder (particels)</td>
<td>(5)</td>
</tr>
</tbody>
</table>

The ion extracted pyrogram (m/z 294, 346, 348) of the lacquer layers:

- **Microchemical test**
  - Detection of pyrrol with Schiff bases with oxalic acid
  - Detection of pyrrol with Schiff bases with dimethylamino-benzaldehyde

- **Polysaccharides**
  - Detection of carbosulfonic acid (SS), SSS=trisulfonic acid; S=shellac acids (a)
  - Detection of pimarate, Sa3=methyl hydroxy-sandaracopimarate; S=shellac acids (b)

- **Proteins**
  - Detection of pyrrol with Schiff bases with oxalic acid
  - Detection of pyrrol with Schiff bases with dimethylamino-benzaldehyde

- **Fatty acids from drying oil**
  - Suberic acid, azelaic acid, palmitic acid, stearic acid, oleic acid