SEAHA EPSRC CENTRE FOR DOCTORAL TRAINING SCIENCE AND ENGINEERING IN ARTS HERITAGE AND ARCHAEOLOGY

Environmental Monitoring of the Mary Rose Museum

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Introduction

The Mary Rose museum, Portsmouth, displays a mixed collection of artefacts from Henry the VIII's warship, the Mary Rose. It is the only recovered 16th century ship in the world and is a time capsule for Tudor history.

The majority of the artefacts are housed in display cabinets, an example of which is shown in Figure 1. Whilst these offer protection from outdoor pollutants, they can trap gases that are generated within the cases due to their low air exchange rate[1], as emphasised in Figure 2, potentially causing damage to the collection[2].

Research Questions

- **What pollutants** are present inside display cases at the Mary Rose Museum?
- **What are the sources** of these pollutants?
- Can **inkjet printing** be used to **improve dosimeter** devices for monitoring gasses in museums environments?

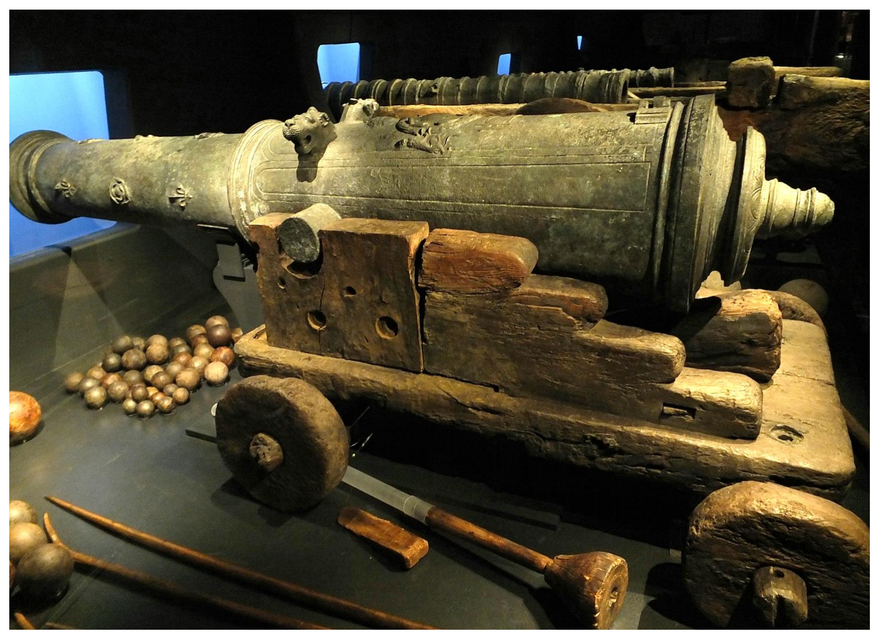

Figure 1: A mixed display at the Mary Rose Museum. Credit: Timelasped, Flickr

Lifting of the Mary Rose hull, 1982. Credit Mary Rose Trust

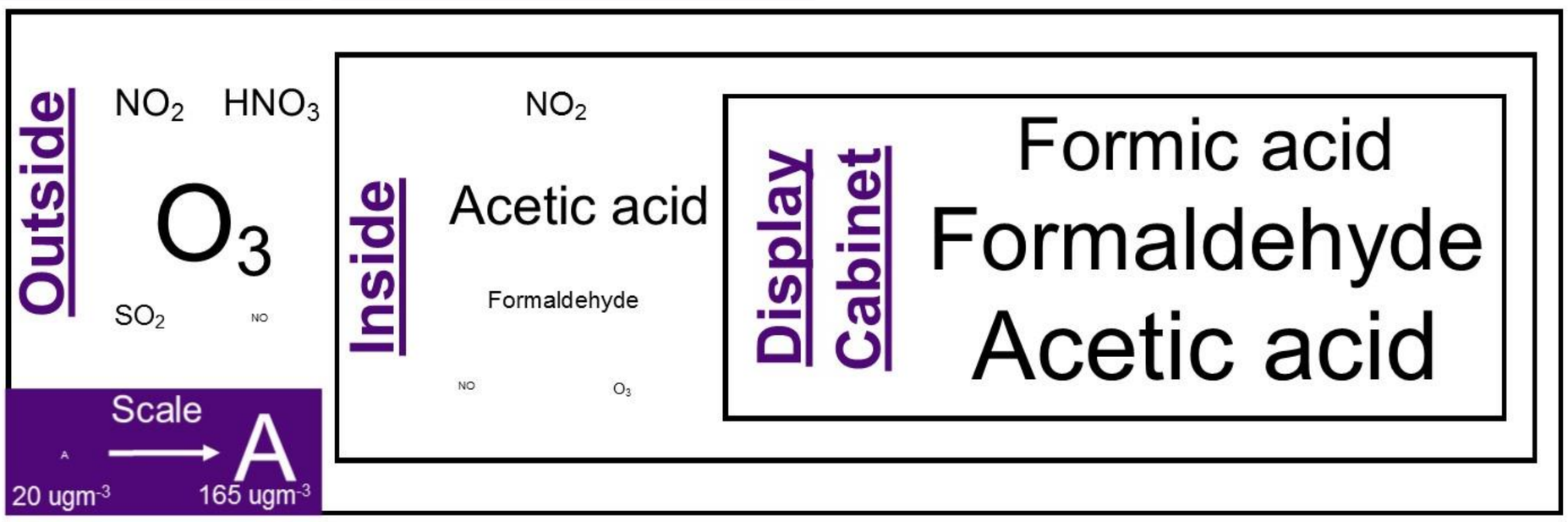

Figure 2. Common pollutants detected outside, inside museums and display cases. Size of font indicates approximate reported concentrations[3] as indicated by the scale.

Methodology

Environmental monitoring of display cabinets in the Mary Rose Museum using:

- **Diffusion tubes** to obtain average concentrations for NO_2, H_2S, SO_2, O_3 and volatile organic compounds (VOCs).
- **Lead coated piezoelectric quartz crystals**, which are sensitive to organic acids.
- **SPME fibres** to capture VOCs emitted from artefacts.

Inkjet printing will be evaluated as a coating method to produce piezoelectric quartz crystal dosimeters.

Initial Results

A Jetlab® 4xl-A (MicroFab technologies Ltd, USA) printer, capable of printing individual picolitre droplets in precise locations, was utilised to print a 7x7 square array of mastic resin (sensitive to nitrogen dioxide[4]) onto a piezoelectric quartz crystal, with each spot made from 200 drops of solution.

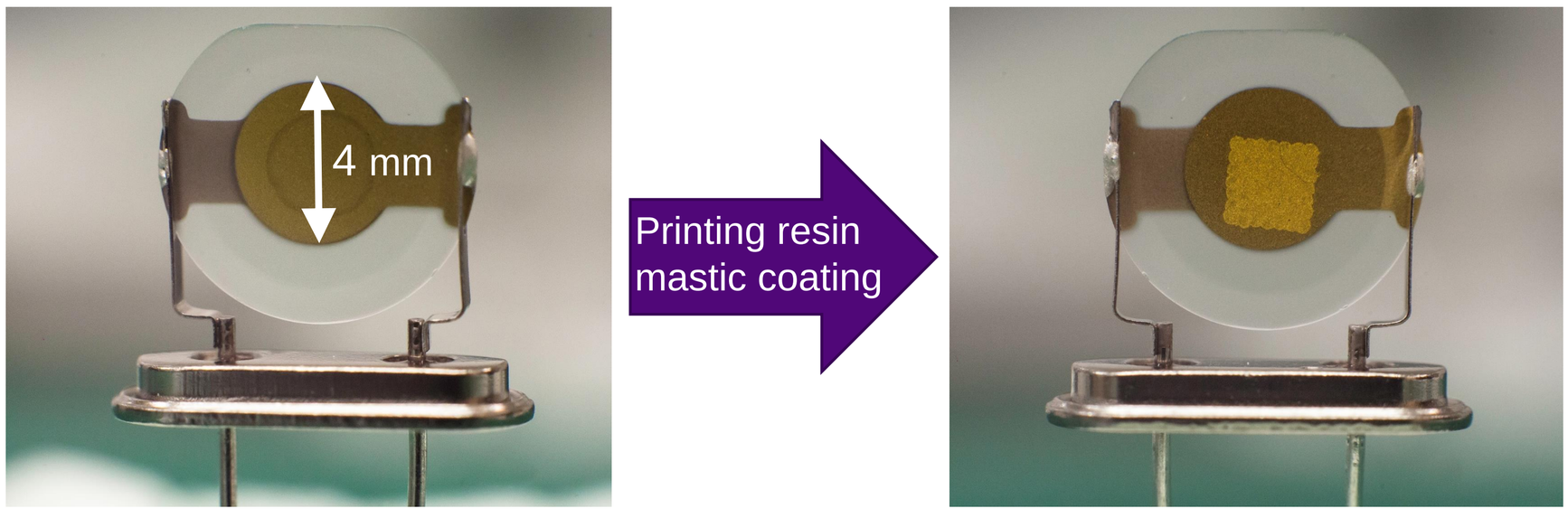

Figure 3: Piezoelectric quartz crystal before and after printing a mastic resin coating.

Dosimeters produced using this method deliver a known amount of calibrant to the sensor with greater precision. This method needs to be compared to those produced using existing methods[5], to determine if precise control of the coating area and thickness improves the repeatability.

References:
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