

## **STUDY OF VOC EMISSIONS FROM NEW, AGED, AND DIFFERENTLY TREATED PARCHMENT**

Irena Kralj Cigic<sup>1</sup>, Matija Strlic<sup>2</sup>, Ira Rabin<sup>3</sup>, Jana Kolar<sup>4</sup>

<sup>1</sup>University of Ljubljana, Faculty of Chemistry and Chemical Technology,  
Askerceva 5, SI-1000 Ljubljana, Slovenia; irena.kralj-cigic@fkkt.uni-lj.si

<sup>2</sup>Centre for Sustainable Heritage, University College London, The Bartlett School of Graduate  
Studies, Gower Street, London WC1E 6BT, U.K

<sup>3</sup>Artifacts treatment and Conservation department, Israel Antiquities Authority, P.O.Box 566,  
91004 Jerusalem, Israel

<sup>4</sup>Morana RTD d.o.o., Oslica 1b, SI-1295 Ivancna Gorica, Slovenia

Despite the number of recent studies of volatile organic compounds (VOCs) emitted by paper, similar studies of other writing supports remain scarce. As we know from studies of paper, volatiles may reveal important information on the quality of the material and on its degradation. On the other hand, absorbed volatiles may also have a pronounced deleterious effect on the rate of degradation of organic materials.

Due to the production process, parchment mainly consists of collagen and calcium carbonate, with some remaining lipids. Due to the moderately alkaline nature of calcium carbonate, emissions of organic acids as a consequence of collagen degradation processes are not expected.

In a study of VOC emissions, performed using contemporary calf parchment, we use solid phase microextraction (SPME) coupled to gas chromatography-mass spectrometry (GC-MS). Using this technique qualitative and semi-quantitative analysis of VOC emissions can be performed. 10 mg of parchment was heated in a closed 2-mL glass vial for 24 h at 80 °C, and after cooling down, the VOCs were extracted using SPME. Desorption and analysis were performed using GC-MS. Ammonia, a usual degradation product of proteins, cannot be determined using this methodology.

We found out that the emissions of volatiles from new parchment are fairly low in intensity. Among the most prominent peaks were ethanol, acetone, acetonitrile, 2-methyl propanal, 2,3-dihydrofuran and butanal, while higher aldehydes were also present: pentanal, hexanal, octanal and nonanal. Several nitrogen-containing compounds were found to be present in trace amounts.

Further studies will include historical parchment, and parchment treated with various historically used conservation treatments with the aim to determine the effect of emitted VOCs on collagen degradation, especially in closed environments.