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"Synchrotron Radiation X-Ray Imaging for Life Sciences & Cultural Heritage"

Synchrotron FTIR microanalysis of art materials from Europe and Australasia at the Australian Synchrotron

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A general increase in the study of cultural heritage materials by users of synchrotron techniques worldwide has been noted over the past 10-15 years and several review papers have been published on this. An increasing number of research projects in the field of art history and conservation are now conducted at the IR microscope beamline at the Australian Synchrotron (AS).

The group of Robyn Sloggett from the Cultural Materials Conservation Centre (CCMC), University of Melbourne, in collaboration with Ljiljana Puskar from the AS, is studying the stability and ageing of modern paints (synthetic oil and acrylic paints) in climatic environments of Australia and Southeast Asia. As a first case study example, paint cross-sections from a late 19th century commercial building in Melbourne, the Provincial Hotel in Fitzroy, identified the period methods and materials [1]. Ongoing research includes a study of aging and degradation dynamics of the Silpakorn paint range both in Thailand and Australia.

Paula Dredge, (Art Gallery of New South Wales), and Gillian Osmond, (Queensland Art Gallery) are exploiting synchrotron FTIR to understand the degradation phenomenon of zinc soap formation and dynamics of soap migration on the micron scale, in particular in paints from the 20th century including those of the iconic Australian artist Sidney Nolan. Zinc soaps form when white pigment, zinc oxide, reacts with fatty acids from oil based paints. These long-chain zinc carboxylates aggregate and, often in the presence of other metal oxide pigments, form lumps, pits and cracks in paintings. In their study of reference paints naturally aged for 13 years and samples from Nolan paintings based on Ripolin® house paints containing zinc oxide, they have been able map the distribution of zinc soaps and correlate it to compositional differences associated with zinc oxide.

Ljiljana Puskar (AS) in collaboration with Daniela Korolija from Matica Srpska gallery, Novi Sad, Serbia, has investigated polychrome decorations of coloured glaze from an Orthodox church dating from 1778. In this work complementary synchrotron ATR FTIR microscopy and micro X-ray fluorescence techniques were used to identify components from individual layers, and in particular the original pigment layer on thin silver leaf.

1. R. Sloggett, C. Kyi, N. Tse, M.J. Tobin, L. Puskar and S. Best. Microanalysis of Artworks: IR Microspectroscopy of paint cross-sections, *Vibrational Spectroscopy* 53, 77-82, (2010).