

## Unilateral Nuclear Magnetic Resonance Studies of Oil Stains on Paper

### ABSTRACT

Oil stains can be transferred to artworks on paper through handling or close contact with an oily object or media. Sometimes it is not desirable to reduce these stains because they represent historical evidence, or are adjacent to sensitive media. When the stains are visually disruptive or the damage is recent, however, it is important to know the safest and most effective treatment options.

Unilateral NMR (Nuclear Magnetic Resonance Spectroscopy) is a novel technique that allows the measurement of NMR relaxation and diffusion parameters directly on the paper surface. NMR relaxation parameters  $T_1$  and  $T_2$  can be correlated to molecular size and motion and therefore they can be used to monitor the presence of large and small molecules present in the paper matrix and how these change with aging, paper type and the action of treatment. In this work we have applied unilateral NMR on a sample population prepared with five types of paper, ten different oils with iodine index ranging from 90–180 and three approaches to aging.  $T_2$  relaxation measurements were collected and correlated to paper type, iodine index, cross-linking degree and treatment.

The potential of unilateral NMR as a tool to determine effective treatment procedures for oils stains on works of art on paper will be discussed.

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