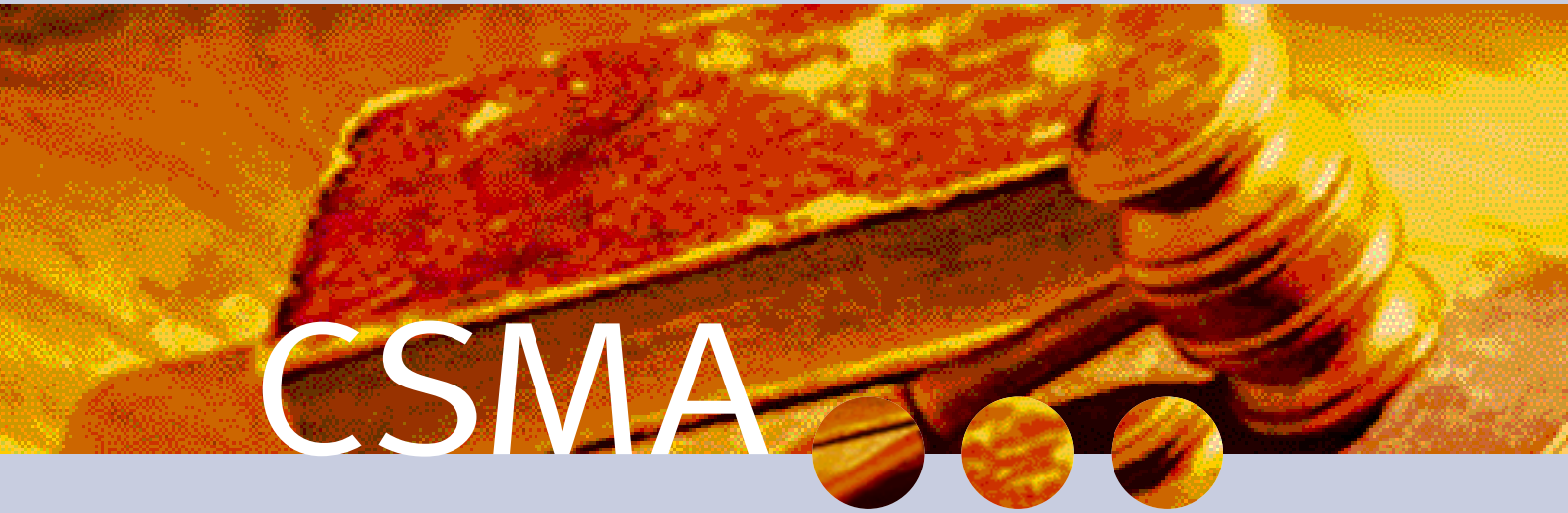
EXPERT WITNESS & LITIGATION SERVICES



For over ten years, CSMA's unique combination of experience in industrial problem solving using surface analysis techniques and litigation services, has successfully guided legal experts and their clients, to satisfactory resolution of their legal cases. These cases have arisen from a broad spectrum of manufacturing industries, where our detailed knowledge of chemical processes, backed by comprehensive analytical facilities produce pivotal technical evidence to support Expert Witness testimony.

BENEFITS TO CUSTOMER

- Pivotal technical evidence to support CSMA Expert Witness testimony
- Clear identification of causes of failure leading to diagnosis of client responsibilities
- Established procedures for control of work programmes and costs
- Expert technical back-up at all stages

CSMA has its own 'in-house' suite of powerful analytical instruments supported by scientific experts to provide technical evidence and advice across a broad spectrum of industrial sectors.

A SELECTION OF INDUSTRIES WE WORK WITH

- Automotive/Aerospace
- Medical
- Semiconductor
- Electronics
- Cleaning Technologies
- Performance Coatings & Surface Engineering
- Building and Construction
- Legal
- Pharmaceutical
- Paints & Coatings
- Packaging
- Domestic & Consumer Goods
- Chemical Industries
- Plastics

CSMA's Expert Witness and Litigation service offers support at all levels in defending product claims, patent protection issues and the settlement of commercial liability disputes. Such support ranges in size from minor claims and report reading/opinion through analytical investigations to High Court actions for significant claims. Assignments are undertaken directly with industrial clients, solicitors or loss adjusters.

CSMA is registered with several Expert Witness directories including:

- The Law Society of London
- UK Register of Expert Witnesses

The case studies shown here illustrate the effectiveness of our rigorous analytical approach which produces a high level of client confidence throughout the legal process.

How To Approach CSMA on Litigation Issues

A simple step by step procedure has been introduced by CSMA Ltd for legal enquiries. A flexible but clearly defined route is identified which can be tailored to the needs of each enquiry. The value of this approach is that the client remains in control of the work programme and costs at each stage in the proceedings. *A typical case would follow the steps described here:*

INTRODUCTION

Initial discussions on the technical aspects of the case will be made free of charge by post, telephone, fax or e-mail. From these discussions CSMA would draw up a proposed work programme for Stage 1, including fixed price quotations for the programme including any on-site visits and meetings.

STAGE 1

Investigations will be agreed, quoted and conducted to assess the technical validity of the case. If these investigations confirm the technical validity then it may be agreed that the Instruction to CSMA transfers to Stage 2. The conclusion of this stage is the completion of a Review Report on the technical aspects of the case and an optional presentation of technical information to the Client. If Civil Proceedings are planned by the clients and their legal advisers with a member of CSMA staff acting as an Expert Witness, then CSMA Ltd. would request a letter of instruction.

STAGE 2

Following the receipt of a letter of instruction, CSMA would issue a letter of acceptance including terms and conditions. Full Contractual, Confidentiality and Intellectual Property agreements will be set and the work programme confirmed. The conclusion of this stage is the completion of an Expert Report and optional presentation of technical information at a Case Conference.

STAGE 3

At the completion of Stage 2, CSMA will accept further instruction with respect to issuing and answering questions from other experts within the time-frames set by the new Rules. Attendance at Court will also be covered by this stage.

CASE STUDY ONE

Paints & Organic Coatings Disbondment

Protective and decorative coatings are essential to our lifestyles but they sometimes fail. Such failures can prove expensive and the establishment of responsibilities is critical to satisfactory resolution of litigation cases. In this example coating failure has occurred on the inside of an enormous water storage tank and the whole coating had to be replaced but whose fault was it?

Was it the fault of:

- the coating applicator?
- the tank manufacturer or their suppliers?
- the coating materials supplier?
- the supplier of e.g. special additive “X” to give better water repellency?

The mechanism and cause of the coating failure was determined using a range of surface analysis methods including XPS, ToF SIMS and Dynamic SIMS. This involved the following steps :-

- investigating where the failure occurred in the coating system.
- identifying the failure mode (e.g. interfacial (adhesive), cohesive, weak interfacial layer) by surface chemical analysis at the locus of failure.
- Estimation of failure kinetics
- Research into remedial action.
- Preparation of Expert Reports.

CSMA scientists proved that migration of a chemical additive from within the paint layer had occurred., resulting in the weakening of the concrete / paint adhesion and subsequent coating disbondment.

CAUSE: - Wrong choice of epoxide hardener. The coating material supplier was at fault.

CASE STUDY TWO

Degradation of Plastic Building Materials

Relevant testing of building materials in the environments where they will be used is essential to avoid short and long term defects occurring. One visual defect has plagued uPVC panels and extrusions applied to the outside of properties in the wetter parts of Northern Europe for several decades. This defect has become widely known in the UK as “Pinking”.

In this example, part of the facia boarding has become pink while other parts of the uPVC structure have remained white, although they were only installed five years ago and have experienced the same weather conditions. This “pinking” problem has been comprehensively investigated and explained by methods developed at CSMA, using a range of surface analysis techniques including XPS, ToF SIMS and Dynamic SIMS. These proprietary methods can be applied to any weatherable grade of uPVC which exhibits discolouration.

The value of undertaking this type of investigation is that:

- The cause of the problem can be determined and responsibilities established.
- Future materials designs can be developed to avoid this and other degradation problems in uPVC.

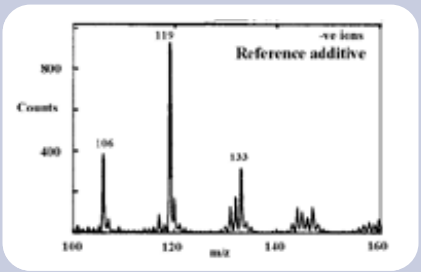
CASE STUDY THREE

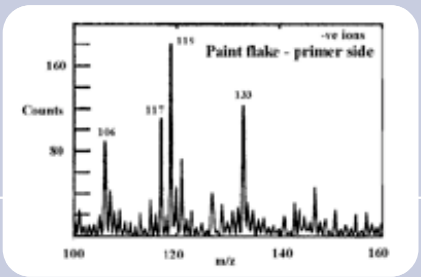
Construction Coating Failure

Coating failures on steel and concrete construction materials occur quite frequently and often at considerable cost in remedial action, lost business and reputation. Surface analysis methods can offer a direct evaluation of samples and, along with expert opinion, determine the origins of the failure which could occur in any of the following areas :-

- Substrate condition
- Coating materials (including additives)
- Coating application conditions

In this case study, a top-coat disbondment has occurred from the red primer layer on steel bridge girders used in motorway construction. The photographs show the construction site and close up views of the underside of a girder with catastrophic delamination of the grey top-coat from the red primer layer.





ToF SIMS detected that an amine additive migrated from the tie layer to internal interfaces forming a waxy overlayer (“bloom”). This weak interlayer caused subsequent coating disbondment. The spectra (left) show confirmation of the amine additive presence on a paint flake from the primer side of the failure.

The cause of coating failure in this case was incompatibility between the hardener and the moisture in the environment during the curing process.

CASE STUDY FOUR

Print Failure on Food Packaging

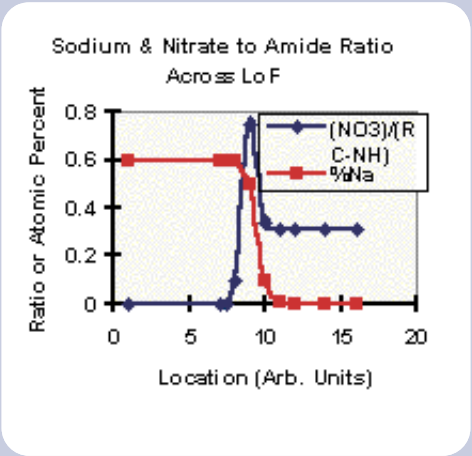
When a product liability dispute arises, the legal responsibility for the failure is the principal argument in the technical case. Ownership of the cause of failure is dependent on the contractual obligations along the supply chain. For print failure cases, such as in this example, it is essential to identify the print failure mechanism. Surface analysis techniques are essential in helping to address many of the critical issues illustrated in the following example.

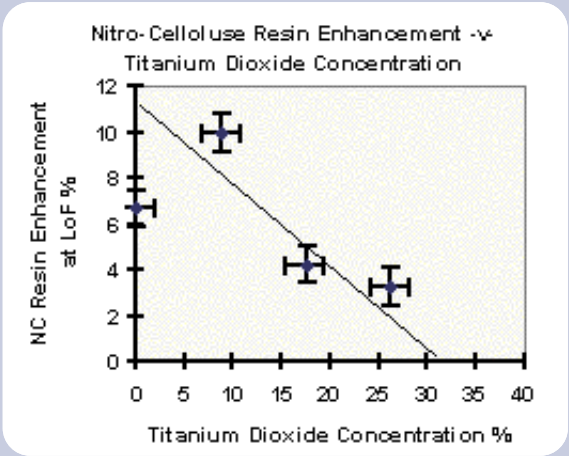
Poultry is frequently packaged in shrink-wrapped polymer film to protect the contents during storage and transportation to the consumer. The polymer (e.g. Surlyn™) is extruded as stretched tube films, printed and then shrink-wrapped on the poultry using sequential hot and cold water douches.

In this example, failure, in the form of ink disbondment, was observed at the cold water douche stage when a white ink sub-layer was omitted, prior to printing with coloured inks (of the same resin system) on white pigmented Surlyn™ film. No failure occurred when the white ink sub-layer was present.

Clearly there was a difference in the adhesion between white on non-white inks (from the same ink family) when printed onto Surlyn™ film and the technical case depended on finding a reliable explanation for this difference. Surlyn™ is a co-polymer of ethylene and methacrylate monomers; and is charge neutralised by sodium ions for food-contact applications. Inks used in this case were composed of nitro-cellulose (NC) resins with a co-resin polyamide to enhance adhesion to the polymer substrate.

Analysis by XPS and SIMS highlighted, for the non-white inks, co-migration of NC resin (from the ink) and sodium ions (from the Surlyn™) to the failure interface during the shrink-wrap process. Water and heat triggered this migration which could not be detected at the earlier print test stage. This migration did not occur when the white ink sub-layer was present on the Surlyn™ film. XPS profiles showed the interface build-up as follows :-





Titanium dioxide in the white ink sub-layer inhibited the co-migration and helped to maintain good interface adhesion in the shrink-wrap process. It was found that the selection of an appropriate ink resin formulation, which would be fit for purpose, was the responsibility of the ink supplier in this case.

CSMA provides a complete surface analysis service to industry to accommodate every level of demand:

- rapid turnaround analysis (24 hours)
- problem solving and failure analysis
- litigation and expert witnesses
- training courses
- reverse engineering and competitor analysis
- materials and product development
- patent registration / infringement

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