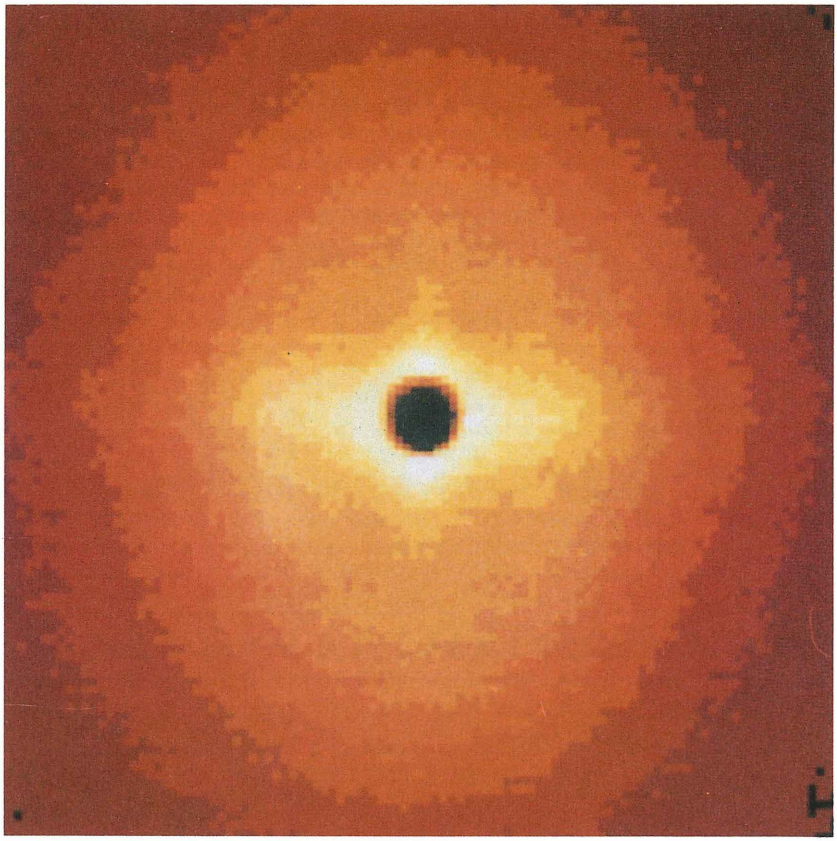
VAMAS



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Versailles Project on Advanced Materials and Standards
Canada, CEC, FRG, France, Italy, Japan, UK, USA.

VAMAS

• AIMS AND ORGANIZATION •

The Versailles Project for Advanced Materials and Standards (VAMAS) supports international trade through projects aimed at providing the technical basis for drafting Codes of Practice and Specifications in Advanced Materials... The scope of the collaboration embraces all agreed aspects of enabling science and technology — data bases, test methods, design methods, materials technology — which are required as a precursor to the drafting of Standards in Advanced Materials. VAMAS activity emphasizes collaboration on prestandards measurement research, intercomparison of test results, and consolidation of existing views on priorities for standardization action. Through this activity, VAMAS fosters the development of internationally acceptable standards for advanced materials by the various existing standards agencies.

With this statement of Purpose begins the new VAMAS description of its "Aims and Organization" adopted by the Steering Committee at its May meeting in Berlin at the German national Bundesanstalt für Materialprüfung. This document, together with the VAMAS Memorandum of Understanding now being signed by the governments of Canada, France, Germany (FRG), Italy, Japan, the UK, the US, and the CEC, completes the foundation for an independent VAMAS. Thus with the conclusion of joint surveillance of the eighteen projects on Technology, Growth, and Employment, at the Tokyo meeting of Heads of State, VAMAS stands firmly positioned to continue its technical activity, which has attracted such strong support in the countries constituting the Economic Summits.

• THE HONDROS LEGACY: A VITAL VAMAS •

As the Chairmanship of the VAMAS Steering Committee passes from Ernest Hondros to Lyle Schwartz, VAMAS stands in debt to its founder and first chairman. The sense of purpose, the vigor, and the strong collaborative spirit which characterize the organization three years following its conception in 1982 - 1983 are a tribute to the insight and strength of Ernest Hondros FRS.

The connection between world economic strength and advanced technology was observed and put into institutional terms by the French four years ago in their proposal for the Economic Summit activities on Technology, Growth, and Employment. Ernest Hondros saw then that advanced materials would have to play a major organizational role in these projects. This would be required because of the new, technically pivotal position of these materials at the center of intense international economic development stimulated by advanced technology.

Ernest Hondros set about systematically to build the necessary new institution. The urgency of his mission precluded waiting for budgets to be allocated or new buildings to be built and staffed. He saw that existing national science and technology organizations in each participating country could, and indeed should, become the distributed location for the activity required.

As a result of the energy inherent in acting on this insight, its timeliness in terms of intense international economic concerns and the rapid evolution of materials science and engineering, and considerable skill in the articulation of these various converging issues, the necessity for substantially increased attention to prestandards research on advanced materials is gaining attention in many different quarters.

In institutional terms, the strength of VAMAS as Ernest Hondros leaves his post as its first Chairman, indeed its architect, is unmistakable testimony both to the validity of his vision and to his skill in realizing it.

• TECHNICAL WORKING AREAS •

Technical Working Area 1

WEAR TEST METHODS

Prof. Dr. H. Czichos, BAM, Unter den Eichen 87
D-1000 Berlin 45

An initial round robin intercomparison of wear measurements in a sliding ball-on-disc configuration is being conducted. The behavior of all four combinations possible with alpha alumina (supplied by the French producer CICE) and AISI 52100 steel is being observed under specified load, sliding velocity, temperature, and sliding distance. By publication deadline May 1986, two thirds of the 38 participating institutions, from all VAMAS countries, had reported results. Wear pattern measurements of material transfer as well as friction coefficient measurements have been made.

At the fifth meeting of the VAMAS Steering Committee held in Berlin in May 1986, the Working Party Chairman reported some of the preliminary results. For the differernt material combinations, typical wear patterns were observed, including substantial material transfer for the steel/steel and steel/alumina systems, but very minor wear for the alumina couple. Comparison of the friction coefficients shows agreement that is relatively good in tribological terms. However, final conclusions can be drawn only after all results of the different laboratories are compiled and evaluated and available to all participants.

The round robin program will be continued with other advanced materials, including silicon carbide.

Technical Working Area 2

SURFACE CHEMICAL ANALYSIS

Dr. C. J. Powell, NBS, Gaithersburg, MD 20899

Three priority areas have been identified: 1) thin oxide films for use as reference materials, 2) calibration data for the energy scale of Auger-electron spectrometers, and 3) procedures for quantitative x-ray photoelectron spectrometry.

In the film area, Canada is producing iron oxide, nickel oxide, and chromium oxide films of about 25 nm thickness on metal substrates. Italy is producing silicon oxide films of a similar thickness on silicon. Laboratories in both countries are scheduled to characterize these films by sputter-depth profiling under specified conditions for comparison with similar measurements on tantalum oxide and nickel/chromium reference materials at NPL and NBS.

Calibration data for the principal Auger electron transitions in copper, silver, and gold in the energy range 50 - 2000 eV are being measured at NPL and NBS as the first stage in a broad interlaboratory comparison of such measurements.

Films of tantalum oxide on silicon are being investigated to determine the parameters for which they are suitable for use as reference materials in an interlaboratory comparison of angle-dependent x-ray photoelecton spectroscopy.

Workshops on quantitative surface analysis are scheduled for October 24 at NBS in conjunction with the Tenth International Vacuum Congress and Sixth International Conference on Solid Surfaces and November 17 at NPL in conjunction with the Fourth Conference on Surface Quantitative Analysis.

Technical Working Area 3

CERAMICS

Prof. P. Boch, ENSCI, 47 av. Albert Thomas, F-87065 Limoges

Two intercomparisons are underway: 1) the determination of environmentally enhanced fracture, led by Stephen Freiman and Edwin Fuller of NBS, and 2) the determination of hardness, led by Roger Morrell of NPL.

The environmentally enhanced fracture of alumina samples will be measured by nine pubic, industrial, and university laboratories in the US, five to seven in the UK, five in France, four in Japan, and the CEC laboratory in the Netherlands. The samples have been furnished to participants by the French producer Desmarquest, while the conditions for testing have been defined by NBS.

The hardness of two other types of alumina samples will be measured to determine the highest precision attainable with high hardness, low porosity materials and that more characteristic of conventional multiphase materials. Detailed procedures to permit precise determination of the sources of variation in routine measurements have been established.

Technical Working Area 4

POLYMER BLENDS

Dr. L. A. Utracki, CNR IGM, 75 blvd. de Mortagne
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Test procedures have been agreed to for an interercomparison of measurements in all VAMAS countries on a blend of polycarbonate and linear low density polyethylene. Melt rheology, dynamic properties in the solid state, thermal behavior, morphology, and mechanical properties are included. An extension of this work to encompass similar measurements and also more extensive characterization of a blend of polystyrene and polyvinylmethylether is being planned. The next Technical working party meeting is scheduled for April 6 and 7, 1987, in Stuttgart.

Technical Working Area 5

POLYMER COMPOSITES

Prof. C. Bathias, Université de Technologie de Compiègne
BP 233, F60206 Compiègne

A survey has been undertaken first, covering measurement capabilities available for the determination of delamination, fatigue, and creep. On the basis of the results of this survey,an experimental program is being designed.

Initial results of the survey on the determination of delamination resistance indicate that it is characterized by fracture tests involving opening mode, shear mode, or a mixture of opening and shear modes. An intercomparison of measurements by the first two approaches to determine the toughness of a glass fiber composite and fatigue crack delamination of graphite fiber composites, as well as glass fiber composites, is being planned in conjunction with an ASTM effort led by Kevin O'Brien NASA Langley. A commercial fine weave glass fabric/epoxy composite will be supplied by the French firm St. Gobain - Vetrotex.

Initial results of the survey on the determination of fatigue indicate that tensile and bending tests are the most common in France, Great Britain, and Japan. Compression tests are less widely used in France, but not in Great Britain. Twisting tests are less widely used in both countries. An intercomparison of the results of bending and tensile tests is being planned with glass fiber composites supplied by St. Gobain - Vetrotex.

Inital results of the survey on the determination of creep indicate that tensile tests are most widely used in France, Great Britain, and Japan. Bending, compression, and twisting approaches are less widely used in these countries. No experimental program is planned now.

Technical Working Area 6

SUPERCONDUCTING AND CRYOGENIC STRUCTURAL MATERIALS

Dr. K. Tachikawa, NRIM, 1-2-1, Sengen, Sakura, Niihari-gun
Ibaraki 305

Round robin tests of the critical current in niobium (3) tin are underway with samples furnished by Japan, the US, and the European Communities. The goal is to establish a consensus on standard methods for measuring superconducting critical current at high fields. Twenty five public, industrial, and university laboratories in Europe, the US, and Japan are taking part.

Discussions on the measurement of superconducting AC losses and the measurement of critical currents exceeding 1000 A are being held. Decisions on experimental programs in these areas will depend on the outcome of these discussions.

An experimental program for round robin tests of fracture toughness at 4 K is being worked out by thirteen public, industrial, and university laboratories in Europe, the US, and Japan. Alloys for the tests will be supplied by Japan, the US, and European Communities.

Other activities in the application of fracture mechanics to the establishment of allowable flaw size, minimum toughness levels, and maximum operating stresses for superconducting magnet construction as well as low temperature shear-test standards for composites are under discussion.

Technical Working Area 7

BIOENGINEERING MATERIALS

Dr. D. De Rossi, Centro E. Piaggio, Pisa

Activity has been divided into four areas by nature of the working environment: 1) Materials in contact with hard tissues; 2) Materials in contact with soft tissues; 3) Materials in contact with blood; and 4) Materials for biotechnology.

Initial emphasis is being placed on the first two areas, materials in contact with hard and soft tissues. In the first area, an intercomparison of implantation tests involving different cell cultures is being led by Dr. G. Heimke of Friedrichsfeld GmbH. In the second area, interactions of materials with blood plasma proteins and/or monoclonal antibodies and with specific cell lines are being planned by Prof. M. Josefowicz of the Université de Paris.

Technical Working Area 8

HOT SALT CORROSION RESISTANCE

Dr. T. B. Gibbons, NPL, Teddington, Middlesex, TW11 0LW

A review of test procedures for superalloy hot salt corrosion resistance is being carried out to determine the range of operating parameters currently in use in four public, industrial, and university laboratories in the UK, five laboratories in Japan, and seven laboratories in the US. When this is completed, an intercomparison of corrosion measurements in two alloys, IN738 and René 80 with two types of coating, platinum aluminide and CoCrAlY, will be carried out.

Technical Working Area 9

WELD CHARACTERISTICS

Dr. H. I. McHenry, NBS, Boulder, Colorado, 80303

A comparison is underway on various calculation procedures for assessing fracture in welded steel structures. Procedures used in Canada, the UK and the US are receiving initial attention. This activity is designed to complement the International Institute of Welding program developing test methods for the measurement of weld toughness. The ultimate goal is a consensus on guidelines to be used for the evaluation of welded steel structures.

Technical Working Area 10

MATERIALS DATABANKS

Dr. J. Rumble, NBS, Gaithersburg, MD 20899
Dr. H. Kröckel, CEC Joint Research Centre, NL-1755 ZG Petten

A consensus report is being prepared establishing priorities for standards needed for the computerization of materials property data. Included are data collection, database building, access to data, and computer integration. Organizations in Europe, Japan, and the US active in the area will be identified.

Technical Working Area 11

CREEP CRACK GROWTH

Dr. T. B. Gibbons, NPL, Teddington, Middlesex, TW11 0LW

Separate intercomparisons of creep crack growth rates of steels and superalloys at high temperatures now in progress in Europe, Japan, and the US are being coordinated within the VAMAS framework. The objective is to carry out a joint evaluation of data to provide the basis for the development of consistent national and international standards. The identification of appropriate correlating parameters will facilitate the application of laboratory data in the prediction of component behavior. A Working Party meeting is scheduled for 9 October 1986 in Knoxville under the auspices of ASTM Task Group E-24.04.08.

Technical Working Area 12

EFFICIENT TEST PROCEDURES FOR POLYMER PROPERTIES

Dr. F. Lockett, NPL, Teddington, Middlesex, TW11 0LW

The nature of polymer properties and of existing evaluation tests for them presents a major challenge in quantitative determination of polymer properties and especially their change with time. More efficient test procedures are required in order to meet increasing demands for more efficient property data collection from a limited amount of testing. This new project will concentrate on two areas: 1) accelerated durability tests for polymers exposed to extreme temperature, light, and/or humidity; and 2) correlations between time, temperature, stress, etc. permitting reliable acceleration of tests or extrapolation of data. The initial efforts consist of 1) a comparison and evaluation of existing methodologies for accelerated durability testing and 2) a review of current correlation procedures and assessment of their future potential.

VAMAS CALENDAR

Technical Working Party reports for Tokyo meeting	*10 Sep 86*
Agenda for Steering Committee meeting in Tokyo	*29 Sep 86*
Creep Crack Growth Technical Working Party meeting in Knoxville	*9 Oct 86*
Workshop on quantitative surface analysis in Gaithersburg	*24 Oct 86*
Steering Committee meeting in Tokyo	*10 - 13 Nov 86*
Workshop on quantitative surface analysis in Teddington	*17 Nov 86*
Polymer Blends Technical Working Party meeting in Stuttgart	*6 - 7 Apr 87*
Superconducting and Cryogenic Structural Materials Technical Working Party meeting in Boulder	*22 - 23 Jun 87*

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FRONT COVER:
Small angle neutron scattering showing the deformation of the molecular network structure in a stretched epoxy resin. The toughness of such resins, and hence their composites, is governed by these deformations. Increased toughness through proper control of the network structure and its deformations will lead to improved resistance to composite delamination, a principal failure mode. Intercomparison of direct delamination measurements in such systems is now being initiated by VAMAS.