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Book Reviews

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Book Reviews

ACID RAIN, A REVIEW OF THE PHENOMENON IN THE EEC AND EUROPE, by Environmental Resources Limited for the Commission of the European Communities, 159 pages (including a summary, an introduction, findings and conclusions and 13 pages with newest references), 24 figures and 14 tables, stiff paper cover, format 302 × 212 mm, EUR 8684, ISBN 0 86010 501 6, Graham & Trotman Limited, Sterling House, 66 Wilton Road, London SW1V 1DE, U.K. (1983), £12.50.

Environmental Resources Limited has examined the extent of environmental damage in the Community and in certain other European countries that may be attributable to acid pollutant emissions within Member States. Besides the Summary, the Introduction and the Findings and Conclusions the document is structured into ten Chapters. The first ones dealing with the emissions, physical transports, chemical transformation and deposition, and biological and biochemical mechanisms causing change and possible damage to terrestrial ecosystems. These chapters include many figures about the already historically introduced SO₂ and its oxidised "wet" form H₂SO₄ (which emissions are slightly declining), and about the "newer" pollutants NO_x and ozone from stationary and vehicle fossil fuel combustion, which emissions are still on a rising trend. Although not all the mechanisms involved are understood, there is evidence that acid emissions and their subsequent chemical transformation products are at least a partial contributory cause to many direct and indirect effects, some of which could be irreversible. Five chapters thus deal with damage to trees and forests, with damage to crops and other plants, effects on aquatic ecosystems and fish (especially loss of fish populations in

lakes), the mechanism of damage to building (the authors distinguish between corrosion of certain materials leading to their early replacement, and reversible and irreversible damage to historic buildings), and the impact on health. In the final chapter costs and benefits of acid emission control strategies are analysed. Economic damage costs were assessed in orders of magnitudes: 200 million \$ for annual forest damage (loss of output) in the F. R. of Germany (this figure is too low in view of the recent acceleration of damages), 1000 million \$ for an annual 10% loss in yield of susceptible crops applied to 40% of growing area for these crops in the EEC, 30 million \$ for the annual loss of fisheries value in affected Scandinavian and Scottish lakes and rivers (irreversible damages and loss of tourism value are difficult to assess), and 500 to 2700 million \$ for annual damage (materials replacement cost) to buildings. Unfortunately this documentation is not very complete, and for instance the studies of Ingo Heinz, D-4600 Dortmund and of the German Federal Home Office was not evaluated (which estimated for this country additional cleaning costs of buildings of annually 1650 million DM, additional cleaning costs for laundry of annually 740 million DM, and repairing costs due to corrosion of materials and historical monuments of annually 38 million DM).

In the conclusions the authors tried to answer 20 important questions (stating the basis information used):

- What is acid rain?
- What is the extent of environmental damage caused by acid precipitation?
- What happens to acid pollutants after they are emitted?
- Which of the emitted acid pollutants, their subsequent derivatives and their deposition processes are the most important in causing environmental damage?
- Are EEC acid pollutant SO_2 and NO_x emissions increasing?
- What are the principal sources for emissions?
- How do acid pollutants cause direct or indirect impacts upon the environment?
- What is the significance of direct or indirect mechanisms in possible acid precipitation effects?
- How widespread in EEC Member States is soil acidification and loss of nutrients resulting from acid precipitation?

- Which soils and water catchments are most susceptible to acid precipitation?
- What is the extent of forest damage in Western Europe caused by acid precipitation?
- What is the cause of tree damage in German forests?
- Is tree damage likely to occur in other EEC Member States?
- What pollution damage or yield loss of crops has been found in EEC Member States?
- What is the extent of acid precipitation damage and of acidified aquatic ecosystems in Western Europe?
- What is the mechanism of fish deaths caused by acidified waters?
- Damage to building materials (steel, zinc, limestone, marble, sandstone)?
- What would be the benefits of emissions control?
- What are the costs of emission control strategies?
- What action is justified in the light of control strategy costs and their possible benefits

E. MERIAN, JANUARY, 1984

STONE DECAY AND CONSERVATION, Atmospheric Pollution, Cleaning, Consolidation and Protection, MATERIAL SCIENCE MONOGRAPHS 11, by Giovanni G. Amoroso and Vasco Fassina, 453 pages (including 301 figures, 72 tables, and a subject index of five pages; references are added to each of the five parts), linen, format 249 × 174 mm, ISBN 0 444 42146 7, Elsevier Science Publishers B.V., Amsterdam and New York (1983) US\$ 97.75 or Dfl. 230.- or SFr. 170.-

The detailed exposition of the state of knowledge of conservation and restoration of stone in buildings and monuments of historical, archaeological and artistic value is structured into the parts

- A. Stone Weathering
- B. Environmental Pollution in Relation to the Deterioration of Stone
- C. Conservation of Stone in Monuments and Building Materials

- D. Products for Treatment of Stone: Chemical and Physical Properties, Reaction Mechanisms and Use
- E. Degradation of Synthetic Resins Used in Stone Conservation.

The book includes also a number of valuable case histories which describe specific projects and the treatment implemented. The book is relevant to civil engineers, construction engineers, architects, geologists, petrologists, minerologists, chemists, conservationists, historians, and restoration research workers.

Environmental aspects of carbon dioxide, nitrogen oxides, ammonia fluorides, hydrochloric acid, sulphur dioxide and sulphuric acid are studied and their reactions with building materials. Meteorological parameters in stone degradation are also examined. The problems of removing grime and soot deposits are discussed in the context of surface chemistry (molecular attraction between stone and various aerosols, products with appropriate wetting properties and low surface tension). Important aspects to be considered prior to treating the stone are analysed, and criteria for the efficient protection are given. The first stage—which needs analytical chemistry—in attempting the conservation of stone must be a diagnosis of the “disease”. Specific features of the book are the thoroughness of the bibliographies, and the citations of monuments and the types of conservation intervention (impregnation) they have received. A valuable list of experts in the fields and their contributions is also included. Important factors which are for instance also discussed are influences of body porosity, interactions with water and humidity (including frost action), physical and chemical properties of aerosols, catalytic reactions, morphology of deterioration, properties of products for treatment of stone (inorganic materials, adhesives, waxes, resins and other polymers), and their identification, degradation, stabilization and weathering (including protection against effects of UV radiation).

E. MERIAN, JANUARY, 1984

WEATHERING OF POLYMERS, by Anthony Davies and David Sims, Waltham Abbey, Essex, U.K., 294 pages (including 96 figures, 62 tables, an index of 6 pages; and references (mostly from 1972 to

1979, a few newer ones) added to each chapter), linen, format 230 × 149 mm, ISBN 0 85334 226 1, Applied Science Publishers, London and New York (1983), £35, (plus £1.75 post/packing).

The volume is of interest to polymer technologists, designers, engineers, research scientists, materials and building scientists, analytical chemists and environmental chemists. Weathering of polymers can produce changes in physical and chemical characteristics which result in significant loss in important mechanical properties. Measurement of such changes and investigation of underlying degradation processes are major areas of activity. Artificial ageing tests and the exposure trials are approaches which are pursued to examine these subjects, particularly to estimate how long a polymer will last in an outdoor application. The outdoor environment, moisture, diurnal cycle and especially the ultraviolet radiation component of sunlight, which is particularly damaging to many polymers, are factors which add to the complexity of the subject.

The first six chapters thus deal with the environment, ultraviolet radiation, weathering trials, artificial weathering, characterisation of degraded polymers, and photo-oxidation and stabilisation. Special attention is for instance given to moisture, pollutants (particulate matter, volatile pollutants), measurement of radiation, specimen preparation, characterisation of materials, spectroscopic techniques, interactions, and stabilisation. Effects of traces of chemically active compounds (dust, smog, attacks of nylon by nitrogen oxides, attacks of polyacetals by sulphuric acid, combined attacks of polyethylene and polypropylene by ultraviolet radiation, oxygen and sulphur dioxide) are however not discussed in great detail, obviously because they are still of minor importance in weathering of polymers. The second and last six chapters are material oriented, and deal with engineering polymers, polyvinyl chloride, vinyl polymers, polyurethanes, rubbers, and composites. In each weathering and ageing mechanisms are described, as well as possibilities for stabilisation. Although the text is written in a rather general form, the figures and especially the tables give relevant information.

A HANDBOOK OF INDUCTIVELY COUPLED PLASMA SPECTROMETRY. M. Thomson and J. N. Walsh. Pages x + 273. Blackie, 1983. £35.00. ISBN 0 216 91436 1.

Inductively Coupled Plasma—Atomic Emission Spectrometry (ICP-AES) has now matured and finds many applications in the field of analytical chemistry. It is therefore surprising to notice, that until recently, no textbook was available on the practice of ICP-AES. M. Thompson and J. N. Walsh accomplished this task. The result is a handbook, covering in 10 chapters subjects as a general theoretical introduction, analytical characteristics, instrumentation, silicate rock analysis, multi-element application in applied geochemistry, gas phase injection, discrete sample injection methods for solid samples, water analysis of environmental materials, and anticipated future developments of the ICP technique. Besides, two appendices are included on safety and manufacturers of ICP systems and accessories.

This book is intended in the first place for workers in the fields of applied geochemistry and the environmental sciences. It may be helpful e.g. in making a choice between simultaneous or sequential systems. Also, detailed procedures for the determination of relevant elements in different samples are presented. Background correction in real world sample analysis is a topic of major interest. However, the reviewer wonders whether the tables of correction factors can be directly applied by the users.

In summary, the book (with literature references up to the beginning of 1983) offers a very good practical introduction to ICP-AES and its application to the analysis of real world samples. It contains sufficient details in order to be used as a handbook. Therefore, it is highly recommended especially to users and potential users of ICP-AES in applied geochemistry and environmental analysis.

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