Book Review

Concrete petrography: a handbook of investigative techniques

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Edward Arnold, 1998. 475 pp. ISBN 0 340 692669. £125

The first impression that one has when opening this book is just how well presented it is with excellent photographs and diagrams. This impression is complemented also by the quality of the text and its clarity.

Concrete petrography means the subject of investigating concrete as a rock. Concrete is indeed instant masonry, and in that regard the description seems appropriate. The other immediate impression is just how comprehensive and authoritative this work is.

The book itself consists of seven chapters, a glossary of minerals, two appendices, a most comprehensive reference listing plus an author and subject index that is equally thorough.

Chapters 1–3 cover the introduction and examination techniques together with sampling and specimen preparation.

The remaining chapters deal with various aspects of concrete such as composition, appearance, deterioration and damage followed by a range of concrete-based and miscellaneous products. There is also a glossary of minerals covering well-known entries such as asbestos, opal, alkali–silica gel and many others but described in a physicochemical manner that is novel to the concrete technologist if not the petrographer, for example amorphous hydrated alumina is referred to as pseudo-boehmite, diachite! The reader gets an early introduction to the language of the book in that the first line of the second paragraph on the first page uses the term ‘argillaceous’ when perhaps ‘clay-like’ would be more familiar. This of course is inevitable since the book is for the professional petrographer and helps to give a very clear focus to the correct terms that we occasionally use rather casually or even try to avoid.

The second chapter of the book deals with microscopic techniques and equipment. It is extremely visual in presentation with coloured photographs of tri- and di-calcium silicates as well as tricalcium aluminate and other phases. This is fascinating to the new reader and

almost forensic in its form. For instance, Plate 13 shows internal bleeding by way of voids beneath an aggregate particle. The evidence is there to see: you simply have to look for it. Having said that, the techniques described are most sophisticated.

This is very much a ‘hands on’ chapter full of practical advice and user techniques.

To the uninitiated reader this is quite a new experience because it is an insight into a specialized world now clearly disclosed. For instance, Fig. 2.16 gives practical and quantitative advice on the matter of point counting and the estimation of errors that are involved. In this sense the book is truly a handbook, and as such I am sure will be used as a practical aid.

The chapter ends with selected literary items referred to as the ‘petrographer’s bookshelf’. Another indicator of how the authors intend that the book should be used: it is not meant to gather dust on the bookshelf but be at the elbow of the investigating petrographer on the bench.

Chapter 3 contains more practical advice, this time on sampling and specimen preparation. Table 3.7 lists stains and etches for different compounds found in concretes—aluminates, silicates, alkali silica gel, slags and so on. You do not have to guess what it might be, it can be a matter of fact.

Chapter 4 covers the composition of concrete as seen by the petrographer—and they undoubtedly see it differently. High-alumina cement as well as ordinary Portland are covered. The text is complemented by many superb coloured photomicrographs.

The importance of the water:cement ratio is touched upon, and its measurement on hardened concrete is described together with the air void system. Admixtures, however, are dealt with rather fleetingly.

Chapter 5 covers the appearance and textures of concrete. Notwithstanding the powerful investigational use that microscopic examination can be put to it is not

widely used. Is this convention, lack of awareness or what? The authors display the power of the techniques and seemingly their practical application with such clarity it is difficult to explain why their use is not more commonplace.

Techniques are described that are deductive in an almost Sherlock Holmes sort of way—quite fascinating.

A most visual and comprehensive picture of hardened cement paste is built up. Because the language is not so specialized in this section it would be a chapter appreciated by engineers and practising technologists.

There is a very interesting section on interfaces, for instance cement against aggregate, but also against steel, fibres and renders.

The penultimate chapter (6) covers examination of deteriorated and damaged concrete. Both intrinsic and extrinsic attack are covered, for instance, in the case of intrinsic, alkali–aggregate reaction as opposed to sulfate attack. The latter is dealt with thoroughly along with acid and alkali attack.

Fire damage associated with concrete is presented very visually, and that topic seems to be in vogue at the moment and of course is most important when looking at the residual life of a fire-damaged structure.

The final chapter deals with concrete products and miscellaneous materials. It is very interesting in that various items, be they pipes pavers, blocks or tiles, are seen from the viewpoint of problems resulting from production.

The text that deals with lime and limestone and hardening of slaked limes by way of carbonation goes back to the earliest times when the Romans mixed hydraulic limes with natural pozzolanas to yield durable concrete. We do the same now but with different methods.

The use of gypsum in various forms for wall board and plasters is described but with a different slant bringing a fresh insight.

At the end of the book is a glossary of minerals cataloguing their optical properties. No doubt of great use to the practising petrographer, assisting in their identification.

This is followed by two appendices, one covering publications in the area of chemical attack on concrete and the other the micrometric determination of mix proportions.

The book is rounded off by a comprehensive alphabetical reference listing plus an author and subject index that is equally comprehensive.

In all, it is a well-presented and fascinating book invaluable to the petrographer but with much data and knowledge for the less specialized professional.

While the book at £125 might be considered expensive, it will become, I am sure, the standard reference work on this subject, and as such represents excellent value. A work of this type has been awaited for many years and will now stand the test of time. I congratulate the authors on their endeavour and achievement.

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