

A REFERENCE GUIDE TO PETROGRAPHIC EXAMINATION SERVICES



Petrography *sensu stricto* is the detailed and systematic description of rocks in hand specimen and in thin-section using high-power microscopy. These same principles can also be applied to the various man-made materials used within the construction industry.

Petrography is typically used to identify the mineralogy of natural materials and identify any potentially deleterious components or features, whilst man-made materials are typically examined to identify the constituents, the overall quality & condition and determine if there is any evidence of deterioration and its causes.

The aim of this brief guide is to illustrate the cornucopia of UKAS-accredited petrographic examination services that RSK STATS Ltd can provide.

A wide range of complementary expertise within RSK STATS Ltd consultancy practice can augment any petrographic examination investigation. This includes chemical analysis (mix proportions of mortar, sulfate content of concrete and chloride content of aggregate), physical testing (eg compressive strength of cementitious products and aggregate durability tests) and specialist mineralogical and elemental composition/analysis (eg scanning electron microscopy, X-ray diffraction and X-ray fluorescence).

Before you commence any laboratory investigation programme involving petrography it is advised that you contact one of our materials scientists.

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There are four main standard methods that are used to examine aggregates; they mainly vary in level of examination detail and reporting format. They are:-

BS EN 932-3 – Simplified Petrographic Description of Aggregate

This method specifies a basic procedure for the brief petrographic examination of aggregates for the purposes of general classification. The procedure is not suitable for the detailed petrographical study of aggregates for specific end uses.

For each sample received we produce a factual certificate estimating the proportions of constituents, divided into major, minor and trace constituents.

Typical turnaround time 10 working days.

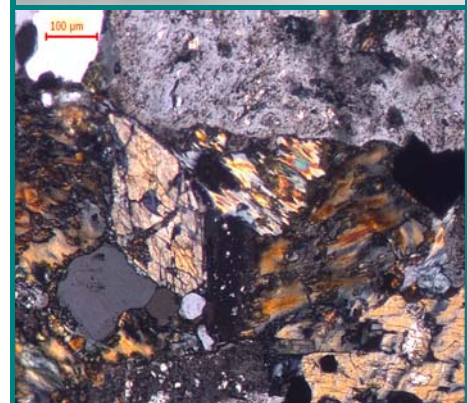
BS 812-104: 1994 – Petrographic Examination of Aggregates

This method describes a general method for the detailed examination of samples of coarse or fine aggregates to determine petrographic composition and to assist in the assessment of those aggregates for potential suitability for the intended use (including concrete). There is no EN equivalent to this test.

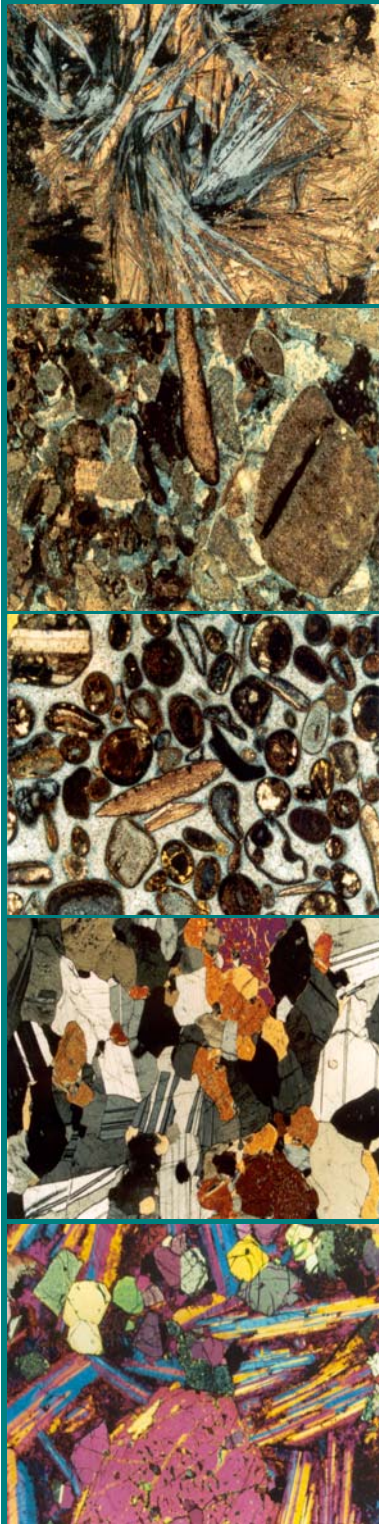
The major application of the method described is in the examination and assessment of processed aggregates.

For each sample we produce a detailed certificate, including photomicrographs (photographs taken through the microscope), which is supplemented by a factual report that summarises the findings and routinely assesses the alkali-reactivity potential (according to BS 7943 for UK aggregates).

Typical turnaround time 10-15 working days



Each examination requires a different test portion mass depending on the nominal grading of the material. Please contact STATS before sending samples to ensure we have sufficient materials to conduct the examination.



TP83 – Petrographic Examination of Aggregates

This method is STATS's in-house procedure that is based upon BS 812-104. The BS method requires duplicate test portions to be analysed, whereas our in-house procedure only uses one portion of aggregate. This reduction from two test portions to one means that we can reduce the turnaround time for the whole high-power microscopical examination whilst still retaining the same high level of detail.

For each sample we produce a detailed certificate, including photomicrographs (photographs taken through the microscope), which is supplemented by a factual certificate that summarises the findings and routinely assesses the alkali-reactivity potential (according to BS 7943 for UK aggregates).

Typical turnaround time 10-15 working days.

ASTM C295 – Petrographic Examination of Aggregates

This American Standard guide outlines procedures for the petrographic examination of samples representative of materials proposed for use as aggregates in cementitious mixtures or as raw materials for use in production of such aggregates.

This examination goes into similar detail as BS 812-104, but separately analyses different sieve gradings and calculates the relative proportions of the constituents as a weighted proportion of the overall sample.

For each sample received we produce a factual certificate detailing and quantifying the individual constituents.

Typical turnaround time 10-15 working days.

BS 5930 – Petrographic Examination of Rock

A petrographic description of rock is important not only for the purposes of geological classification but also in order to highlight constituents, textures and features influencing its chemical, physical and mechanical behaviour.

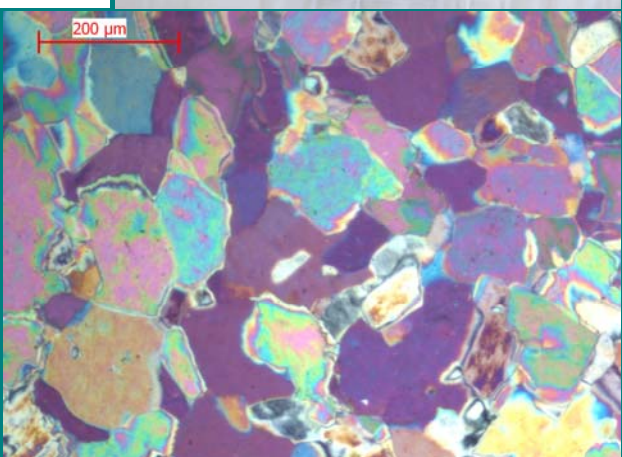
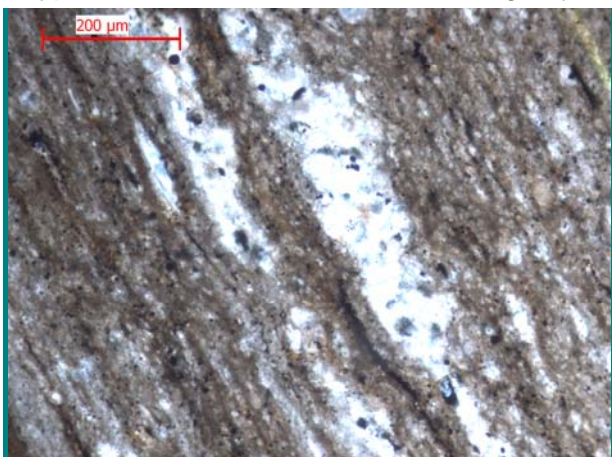
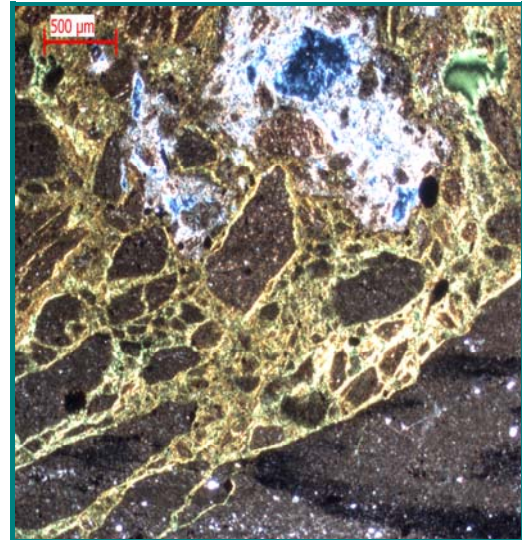
It is therefore essential to characterise the rock not only from the point of view of their mineral components and of their fabric and structure but also in terms of any features such as: colour, presence of veins, of fossils, of discontinuities, etc.

Typically an examination will include details about the following;

- Mineral composition
- Structure
- Colour/Discoloration
- Texture
- Grain size
- Weathering classification
- State of alteration
- Discontinuities
- Fracture state
- Geological classification

For each sample we produce a factual certificate, including photographs and photomicrographs (photographs taken using a microscope).

Typical turnaround time 10-15 working days.



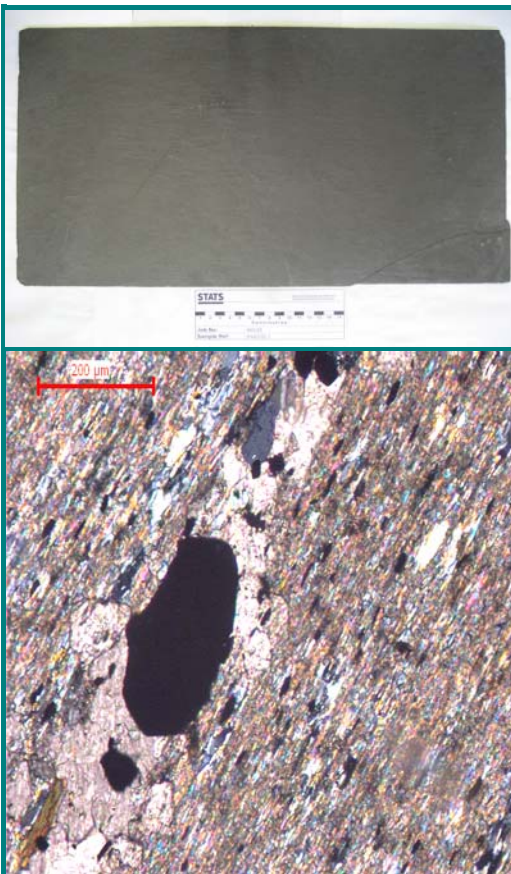
BS EN 12407 – Petrographic Examination of Stone

A petrographic description of natural stone is important not only for the purposes of petrographic classification but also in order to highlight constituents, textures and features influencing its chemical, physical and mechanical behaviour.

A petrographic description will include detail on mineralogy, structure, texture, grain size, state of alteration, discontinuities, fracture state and geological classification.

For each sample we produce a factual certificate, including photographs and photomicrographs (photographs taken using a microscope).

Typical turnaround time 10-15 working days.



BS EN 12326-2 – Petrographic Examination of Slate

The full hand-specimen and low & high microscopical examination of slate not only highlights the composition but also determines if there are any features that may influence its chemical, physical and mechanical behaviour.

Particular attention is paid to the presence of any iron sulfide minerals (eg pyrite) that may oxidise in service and cause deterioration of the slate fabric; any calcite and any residual unaltered clay minerals and geological features that might act as defects.

The examination can also determine whether the product is a true slate (in the geological sense) or another rock type that may be used a roofing slate (in accordance with BS EN 12326-2).

For each sample we produce a factual certificate, including photographs and photomicrographs (photographs taken using a microscope).

Typical turnaround time 10-15 working days.

ASTM C856 – Petrographic Examination of Concrete

Petrographic examination is an essential part of any laboratory investigation of concrete or any other cementitious material.

There is no BS or BS EN equivalent of this standard. However, ASTM C856 is widely accepted as the industry method for the examination of concrete.

Concrete petrography can be used to investigate a broad scope of features, including constituents, quality and condition:-

Constituents

- Aggregate type
- Aggregate constituents
- Aggregate contaminants
- Matrix characteristics
- Mineral additives
- Cement type

Quality & Condition

- Air void content
- Water/cement ratio
- Compaction
- Microporosity
- Carbonation (degree & depth)
- Portlandite

Investigations into possible distress and/or deterioration, including:

- Fire-damage
- Delayed ettringite formation (DEF)
- Sulfate attack
- Internal sulfate attack
- Thaumassite form of sulfate attack (TSA)
- Secondary deposits & leaching
- Alkali-aggregate reaction (AAR)
- Chemical attack
- Aggregate shrinkage
- Freezing and freeze-thaw cycling

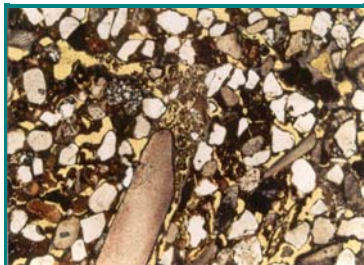
For each sample we produce a factual certificate, including core log, photographs and photomicrographs (photographs taken using a microscope).

Typical turnaround time 10-15 working days.

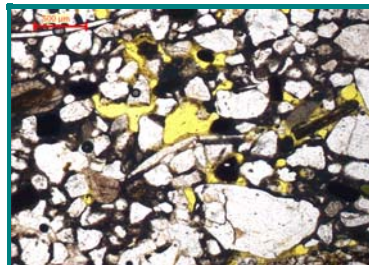


Petrographic Examination of Materials

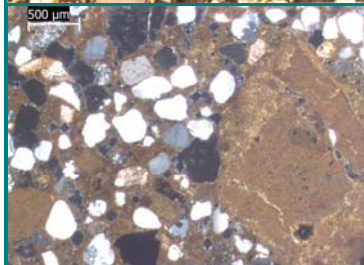
Photomicrographs (photographs taken through an optical microscope) are shown below illustrating some of the other materials that are examined using the same techniques:-



Sand /cement mortar



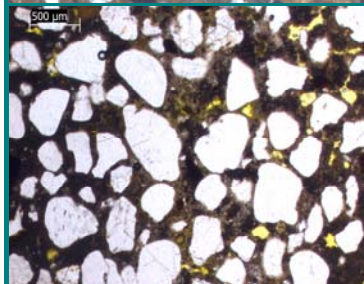
Screed



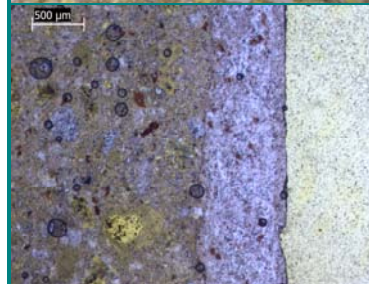
Lime mortar



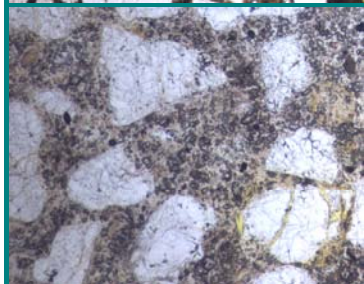
Paint



Render



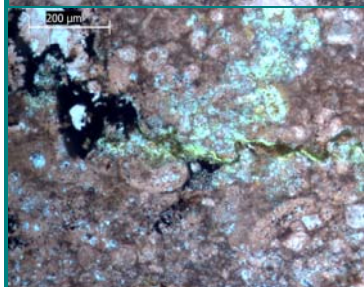
Plaster



Adhesive compounds



Levelling compounds

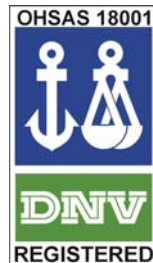
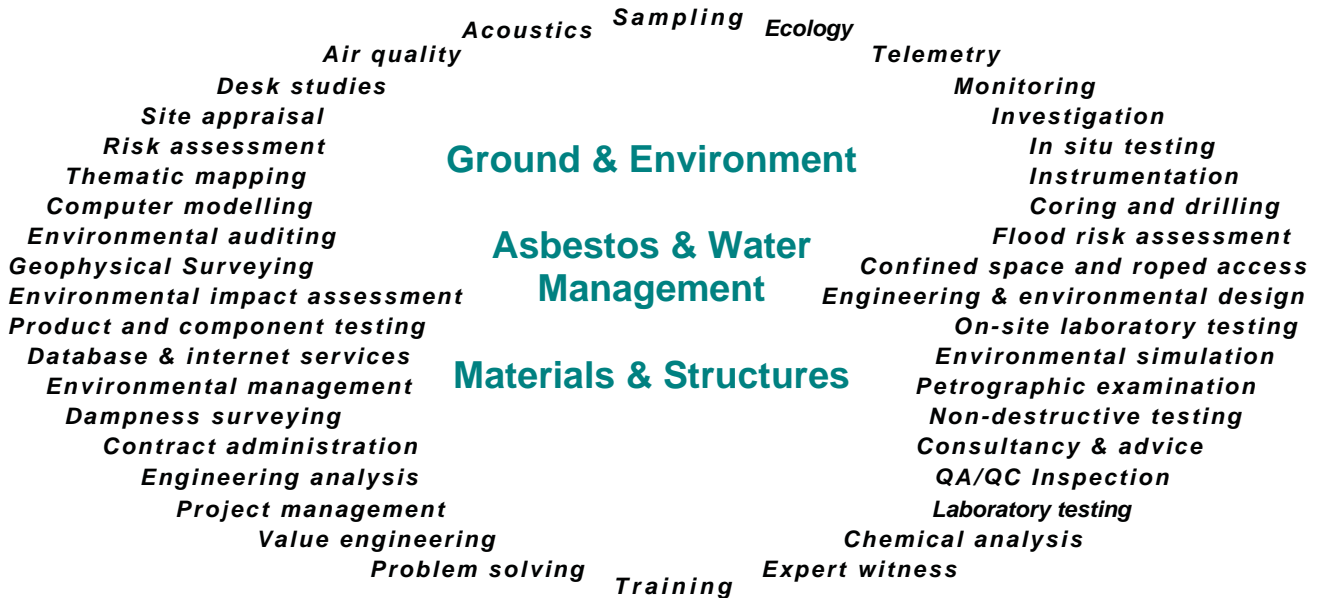


Bricks & tiles



Fibre-cement products

RSK STATS Ltd (formerly STATS Limited, founded 1974) is a specialist firm of engineering and materials consultants. The group encompasses a wide range of professional engineers, scientists and technologists, with extensive experience in litigation, arbitration and other forms of dispute resolution on a wide range of civil, structural, and geotechnical engineering topics, building technology, building and construction materials and environmental issues.



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