

## GRAIN-SIZE MEASUREMENT FROM ACETATE PEELS<sup>1</sup>

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### INTRODUCTION

The use of thin sections is essential in making grain-size measurements on indurated siliciclastic sediments. Carbonate rocks, however, are commonly examined by means of acetate peels, which are simpler and less expensive to prepare than thin sections. A method of grain-size measurement from acetate peels is described in this paper. The method was developed by the author during a study of Lower Carboniferous bioclastic limestones (Gutteridge 1983).

### METHOD

Prepare an acetate peel of a smooth, planar surface using the method described by Katz and Friedman (1965). It is not necessary to stain the specimen, but staining may assist in the identification of allochems. Experience has shown that peels provide an accurate reproduction of smaller (e.g., less than 100  $\mu\text{m}$ ) allochems.

To avoid bias of measurement arising from preferential grain orientation, rock specimens should be sectioned in a consistent direction, for example, in a plane parallel to bedding.

Mount the peel together with an opaque scale bar (such as a line drawn on the peel or a piece of card cut accurately to known length) between two glass plates and print an enlargement of the peel on photographic paper. This will produce a negative print of the peel with the scale bar appearing as a white shadow. The degree of magnification can be determined by measuring the enlargement of the scale bar on the final print.

Grain size can be measured from this print by means of a binocular microscope with a graduated eye piece. The use of a programmable calculator is recommended so that the graticule measurement can be converted to millimeters of phi units by taking account of the magnification.

Methods of grain-size measurement from thin sections have been reviewed by Kellerhals et al. (1975). Any of these can also be applied to peels. In the study mentioned above (Gutteridge 1983), *grain size* was defined as the maximum apparent dimension of grains that were encountered along a series of randomly oriented transects across the print.

Flugel (1982) shows that at least 300 grains must be measured on each specimen so that a representative grain-size distribution is obtained.

### ADVANTAGES OVER THE USE OF THIN SECTIONS

This method has the following advantages over the use of thin sections:

- a) The production of peels and prints is quicker and less expensive than thin sections.
- b) This method produces a print which is an enlargement of the original peel, and so grain size can be measured more accurately from the print than from the original peel.
- c) Since peels provide a two-dimensional section through the rock, this method does not suffer from the effects of grain shadowing described by Harrell (1981), which may be a source of error in grain-size measurement.
- d) Peels can be made of much larger surfaces than is possible with thin sections, which is advantageous in two ways. A much larger number of grains can be sampled per specimen, and, thus, a representative sample is more likely to be obtained. Also, this method can be used in the study of coarse-grained sediments whose clasts are of such a size that very few would be accommodated on a conventional thin section.
- e) Manipulation of the print does not require a mechanical microscope stage and can easily be achieved by hand.

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CONCLUSION

Gindy and Sultan (1978) showed that grain-size analysis from thin section can be successfully applied to the study of carbonate rocks. A method of grain-size measurement has been presented that avoids some of the disadvantages inherent in the use of thin sections and exploits the relative ease whereby acetate peels can be prepared for the examination of carbonate rocks.

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GRAIN-SIZE MEASUREMENT FROM THIN SECTIONS

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Method of grain-size measurement from thin sections have been reviewed by Gindy and Sultan (1978). Any of these can also be applied to peels. In the study mentioned above (Gutteridge 1983), peels were used instead of the traditional apparatus. Measurement of grain size was accomplished using a series of randomly oriented acetate peels. The method (1983) shows that at least 100 grains must be measured in each specimen so that a representative grain-size distribution is obtained.

ADVANTAGES OVER THE USE OF THIN SECTIONS

- The method has the following advantages over the use of thin sections:
- (1) The preparation of peels and peels is quicker and less expensive than thin sections.
  - (2) The method provides a point which is an enlargement of the original peel and so grain size can be measured more accurately than the grain size from the original peel.
  - (3) Peels provide a two-dimensional section through the rock. This method does not suffer from the effects of grain elongation described by Harrell (1981) which may be a source of error in grain-size measurement.
  - (4) Peels can be made of much larger surface than is possible with thin sections which is advantageous in two ways. A much larger number of grains can be sampled per specimen and, thus, a representative sample is more likely to be obtained. Also, this method can be used in the study of coarse-grained sediment where grains are of such a size that very few would be accommodated on a conventional thin section.
  - (5) Preparation of the peels does not require a mechanical microscope stage and can easily be achieved by hand.

INTRODUCTION

The use of thin sections is essential in making grain-size measurements on sedimented siliceous sediments. Carbonate rocks, however, are commonly measured in terms of peels. Peels are simpler and less expensive to produce than thin sections. A method of grain-size measurement from acetate peels is described in this paper. The method was developed by the author during a visit to James Gindy's Geology Institute, Cambridge (1983).

METHOD

Peels are acetate peels of a rock. Gindy and Sultan (1978) described the method of Gindy and Sultan (1978) in which peels are prepared by staining the rock with a solution of potassium dichromate. This method has shown that peels provide an accurate representation of the grain size of the rock. To avoid bias of measurement arising from preferential grain orientation, rock specimens should be sectioned in a consistent direction. The method is a simple method to produce peels. The peels are prepared by drawing on the peel or a piece of card the necessary to lower length between two glass plates and then an enlargement of the peel on the acetate paper. This will produce a negative print of the peel with the grain size appearing as a white shadow. The degree of magnification can be determined by measuring the enlargement of the scale bar on the peel peels.

Grain size can be measured from this print by means of a planimeter or microscope with a graduated eye piece. The use of a planimeter or calculator is recommended so that the grain-size measurement can be converted to millimeters of the rock by taking account of the magnification.