Smear Slide Method

Smear slides samples are a rapid, simple and cheap way of examining marine sediments. As only a very small sample size is required (1-2 mm^3), even archive cores can be sampled without being damaged. As well as sediment cores, smear slides can also be used to examine sediment attached to dredged rocks, lithified borehole samples and unconsolidated terrestrial sediments.

Sampling Strategy

All major lithologies should be sampled. The number of samples taken from the core will depend on the homogeneity of the sediment, the presence of any unusual features or features of specific interest and any specific aims of the study. Cores that are homogeneous in composition, such as a diatomaceous ooze, may only require one or two slides to be made.

Making a Smear Slide

To make a smear slide:

- Start by using a diamond pen to etch the core ID, section number and depth of the sample onto a clean, clear glass microscope slide.
- Using a toothpick or small spatula take a sample from the surface of the core (only 1-2 mm^3 is needed).
- Place the sample on to the microscope slide and disperse using a few drops of distilled water.
- Using the toothpick, smear the sample out over the slide into a very thin film. The sediment should be sufficiently dispersed to allow for recognition of the finer components. If the smear slide is being created for the examination of coccoliths, create alternating thin and thick bands of sediment on the slide with the toothpick.
- Place the slide on a hot plate (low temperature) to evaporate the water. Once dry, remove and allow to cool.

- Put a few drops of 'Norlands Optical Adhesive 61' on to the sample and apply a glass cover slip. Note: there are two different types of coverslips. For the examination of coccoliths, a thin cover slip should be used. A thicker cover slip should be used if creating the slide for the examination of silt and sand fractions within coarser sediment.
- Take care to expel any air bubbles from under the glass (this can be minimized by placing the cover slip on from a 45° angle) and ensure the cover slip is sealed up to each edge.
- Wipe away any excess adhesive with a tissue and place the slide onto a UV light curer for approximately 5 minutes to set the adhesive.
- Clean the slide with a tissue and attach a sticky label indicating core ID, section number and depth of the sample.
- The slide is then ready for viewing under a petrological microscope.

Examination of Smear Slides

A good quality petrological microscope (preferably fitted with a mechanical stage) is required for the examination of smear slides. Transmitted light and phase contrast can be used to visualize biogenic sediments and heavy minerals. Most clastic components can be viewed using polarized light.

For each smear slide the components of the sediment are identified and the percentage abundance of the following constituents are recorded on a Smear Slide Description sheet (see page 5):

1. Terrigeneous: Quartz, feldspar, rock fragments, volcanic glass, clay, mica and accessory minerals.

2. Biogenic: Diatoms, Radiolarians, spicules, silicoflagellates, foraminifera, nannofossils, plant debris and accessory components.

The percentage abundance should be estimated using a percentage composition chart such as that used by ODP (Figure 1) based upon Terry and Chillingar 1955. In order to ensure percentage estimates are consistent at least 40% of the smear slide analyses should be duplicated.

On the basis of the dominant constituents the sediment can be classified and the dominant and minor lithology should be indicated on the description sheet.

For a more detailed explanation of the process for making a smear slide and mineral identification see Rothwell, 1998.

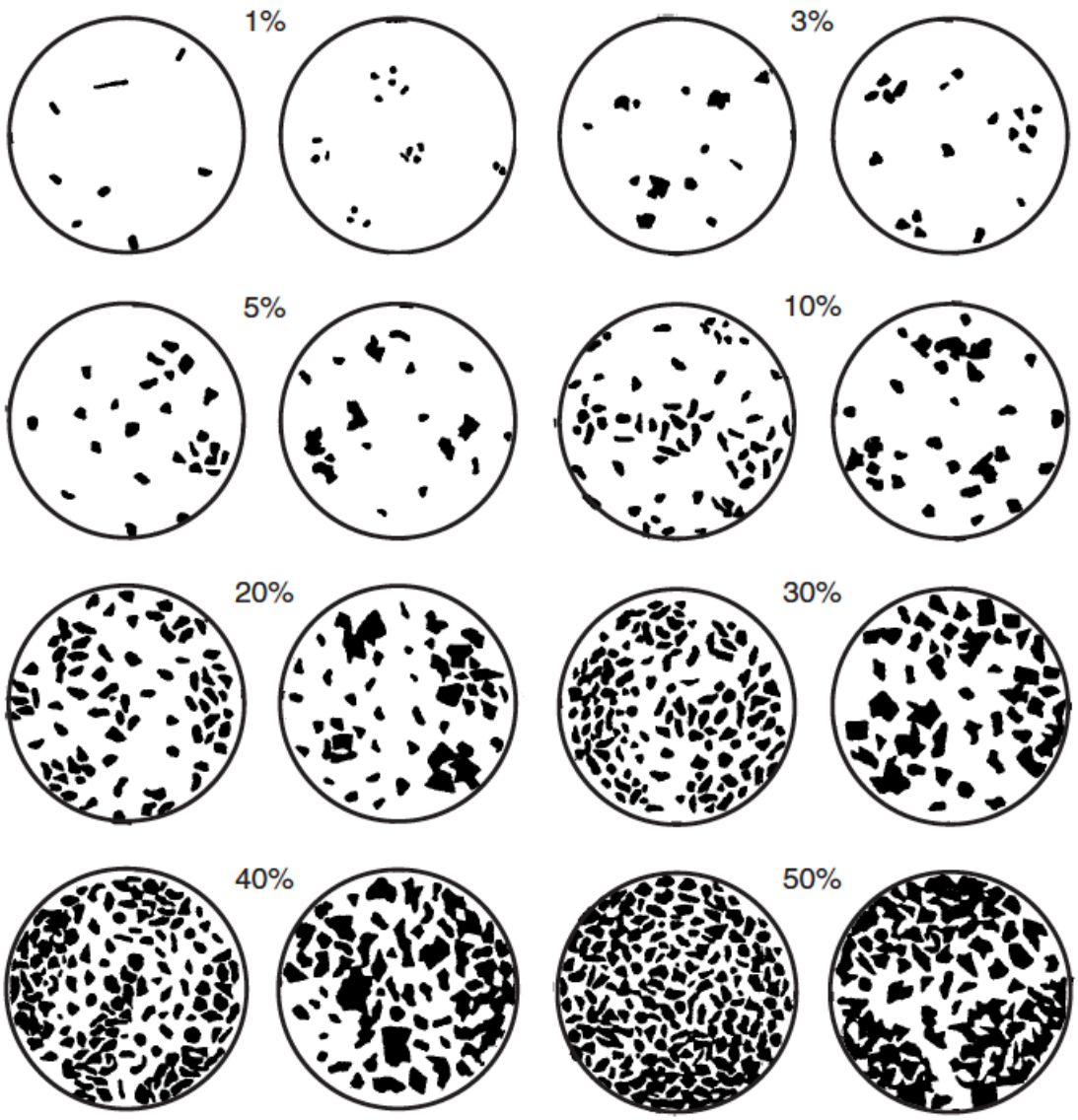
References

Tarduno, J.A., Duncan, R.A., Scholl, D.W., et al., 2002. Proceedings of the Ocean Drilling Program, Initial Reports, Volume 197.

Terry, R.D., and Chilingar, G.V., 1955. Summary of “Concerning some additional aids in studying sedimentary formations” by M. S. Shvetsov. J. Sediment. Petrol., 25:229–234.

Rothwell, R.G., 1989. Minerals and Mineraloids in Marine Sediments: An optical identification guide, Elsevier Applied Science, London, 279 pp. (ISBN 1-85166-382-7).

Figure 1: Comparison chart for visual percentage estimation (Tarduno et al 2002, after Terry and Chilingar, 1955).



SMEAR SLIDE DESCRIPTION

Cruise _____ Core ID _____ Section _____

Date _____ Observer _____ Subbottom depth _____

Sediment name _____

Lithology _____(dominant) _____(minor)

Sorting _____ Clast shape _____ Colour _____

TEXTURE:	% Sand	% Silt	% Clay	
Overall	_____	_____	_____	(= 100%)
Terrigenous	_____	_____	_____	(= 100%)
Biogenic	_____	_____	_____	(= 100%)

COMPOSITION: % Terrigenous _____ % Biogenic _____ (= 100%)

Terrigeneous (% total grains):

- Quartz _____
- Feldspar _____
- Rock fragments _____
- Volcanic glass _____
- Clay _____
- Mica _____
- Accessory Minerals _____
- Others _____

Biogenic (% total grains):

- Total siliceous _____
  - Diatoms _____
  - Radiolarians _____
  - Spicules _____
  - Silicoflagellates _____
- Total calcareous _____
  - Foraminifera _____
  - Nannofossils _____
- Plant debris _____
- Accessory components _____
- Others _____

COMMENTS: