

PLASTIC—A SUITABLE EMBEDDING SUBSTANCE FOR PETROGRAPHIC STUDY OF COAL AND FOSSIL PLANTS

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Coal may be studied from different points of view and with several micro-techniques. A method for embedding coal, suitable for petrographic studies, is described in this note. By this method a sample of coal or a fine-grained preparation of powdered and sifted coal is embedded in an appropriate cement and highly polished for examination under the microscope and in reflected light. The embedding substance proposed is a resin, a liquid plastic known as Marco 26 C. It consists of a copolymer of styrene and polyester of allyl which has the following characteristics: it polymerizes slowly at room temperature; its hardness is similar to that of coal and ensures a regular polishing plane without polishing stress; it is structureless and sharply contrasts with coal; it is unaffected by the immersion oil used for microscope objectives.

Technique

(1) The commercial syrup must be prepared for use in the following manner and quantity: 0.48 gm. hydrocyclohexyl peroxide (HCH) is dissolved in 4 cc. styrene to which 20 cc. resin are added; (2) a layer, 2-3 mm. in thickness, of this mixture is poured into a mould to form a supporting layer. The size of the mould is adjusted

to that of the coal sample and may be of glass, metal or plaster. Greasing the mould with vaseline before pouring the mixture facilitates the removal of the finished cast; (3) the supporting layer is allowed to gel in a drying oven at 35°C for about 15 minutes; (4) when the surface begins to jelly, the coal sample (here about 5×3×3 cm. in size) is placed on the supporting layer and the remainder of the fluid mixture is poured over until the specimen is fully covered; (5) the mould is placed for about 12 hours in a drying oven at 35°C until complete polymerization has taken place and is then left to cool slowly; (6) when cooled, the cast is removed from the mould.

Such a preparation is clear, transparent, and easy to polish. The plastic closely comes in close contact with the block of coal, and neither of them crumbles when polished. The polymerization being slow, the rise of temperature is not appreciable and does not affect the coal.

If Marco 26 C is not available, another polyester, Markon 7 may be used. This too is transparent, but its colour is darker and it is more viscous.

The polymerization may be hastened with the help of an accelerator; but this causes a rapid rise in temperature and some concomitant difficulties arise: (1)

monomer + catalyst + accelerator
monomer + catalyst 80 + accelerator 5 a 10 mm h. apres

loosening of the supporting layer from the remainder of the cast; (2) shrinkage-cracks when cooling; and (3) bubble formation. To avoid this, two mixtures are suggested. If a deep penetration of the resin is desired, a low viscosity mixture can be prepared consisting of 20 gr. resin, 10 cc. monomer, 1 gr. catalyst, and 4 drops accelerator; the polymerization occurs after about two hours at a temperature of 45°C. For fine grain embedding, on the other hand, a high viscosity mixture is more suitable consisting of 50 gr. resin, 8 gr. monomer, 1 gr. catalyst, and 6 drops accelerator; the polymerization occurs after 18 hours at 45°C. In both cases, polymerization takes place without bubbles or shrinkage-cracks. The temperatures given above are suitable for *fresh* resin; experience has shown that if the resin has been prepared in advance, these temperature should be reduced.

In a previous paper, Leclercq and Discry (1950) have described two embedding methods suitable for Devonian plants. One of these has since been successfully adapted to the petrographic study of coal. It is not without interest to sum up here the differences in application.

Upper Devonian plant remains are, sometimes, impregnated with an iron hydroxide substance which retains the internal structure. The iron hydroxide plus the organic residue becomes opaque and, for that reason, unsuitable for thin sections. On the other hand, the mineral substance is friable, so that the specimen usually a tiny fragment, a few millimeter in length impregnated with iron hydroxide must be hardened to be easily embedded and polished for microscopic examination under strong reflected light.

The technique consists of several successive immersions: (1) absolute alcohol (one hour); (2) 50-50 absolute alcohol and styrene (two or three hours) under vacuum bell in order to facilitate impregnation; (3) meanwhile a supporting layer of the prepared resin as described on page 222 in para 1 is allowed to gel in a drying oven at 60° C for about 15 minutes; (4) the immersed fragment is laid upon the jellified surface of the resin; (5) the whole system is put under a vacuum bell provided with a *tap funnel* into which the remaining part of the fluid prepared resin is poured; (6) the resin is slowly dropped into the mould, and the latter kept for 30 minutes under the vacuum bell in order to assure a good penetration and removal of bubbles; (7) the mould is kept about 12 hours in a drying oven at 60°-80°C; (8) when cooled, the cast is removed from the mould (if adhering to the mould, it is plunged for a few minutes into boiling water). The surface of the cast which has remained in contact with air may be slightly sticky; in which case the sticky film may be removed by polishing.

The cast is then ready to be cut and polished. The cutting is done with a fine-toothed disc-saw lubricated with alcohol. When the plastic block has been sawed to the desired form and level, it is ground with carborundum powder number 300, then 800. It is further ground on a sheet of tin with an English emery B.M. 303½ mixed with glycerine and finally on a soft felt wheel with alumina No. 3 in water suspension.

The use of transparent plastic as embedding substance is very suitable if the study of a specimen requires oriented cutting and multiple successive observations at pre-determined intervals.

Literature Cited

LECLERCQ, S. & DISCRY, M. 1950. De l'utilisation du plastique en paléontologie végétale.

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