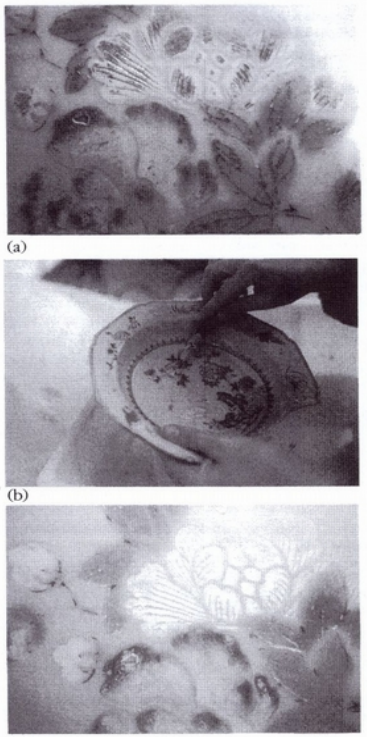


(a)

(b)

(c)

**Figure 7.5** The use of an air polishing tool for cleaning worn overglaze enamel: (a) shows the enamels before cleaning; (b) the tool in use; (c) the enamels after cleaning.

Alternatively the stain may be left in place but treated with a bleach to render it colourless.

## Organic stains

Many stains in ceramics are organic in origin, often having been caused by food, and hence are soluble in one or more of the organic solvents. Some organic stains, such as those caused by mould growth, are not readily soluble and in these cases removal of the colour of the staining material by bleaching may be an appropriate way of treating the stain. Certain alkalis can be used to remove organic stains of a greasy or waxy nature.

### *Solvent packs and poultices*

When the stain is deep within the body one way of allowing the solvent to penetrate to it is to soak the whole object or fragment in a bath containing solvent. This can be a very extravagant use of solvent and relies on the relatively slow removal of the stain by diffusion and dilution. Instead, the method normally used is to apply the solvent as a pack or poultice. The solvent is mixed with a suitable material and spread over the surface of the object. Some of it becomes absorbed into the body of the ceramic where it dissolves the dirt. As solvent begins to dry off from the outer surface of the pack, the solvent/dirt mixture is drawn back out into the pack. Eventually all the solvent evaporates off the outer surface of the pack, leaving the dirt behind in the pack. If practical, the object or fragment must be completely encased in the pack or the solvent/dirt mixture may simply be moved to another area of the body, and if the solvent being used is very volatile the object and pack should be encased in polythene sheeting or other suitable material to slow down the rate of evaporation of the solvent and allow complete penetration of the body and removal of the stain.

Various poulticing materials can be used, but one of those most commonly used is hydrated magnesium trisilicate, or sepiolite. Hydrated magnesium-aluminium silicate (attapulgite) has also been used, although this clay has been classified as a health hazard, being a possible carcinogen (Marconi, 1989). Recently work has been carried out using a third clay, bentonite (Lazzarini and Lombardi, 1990), for the cleaning of stonework and the desalination of marble, and results comparable to those found with sepiolite have been achieved. Laponite, a synthetic clay has also been used recently, with good results (Ling, 1991; Hogan, in press).

Sepiolite takes the form of a finely divided powder when dry, and is mixed with solvent to a thick paste that is spread over the surface of the object in an even layer 1–2 cm thick. The object should be coated all over in order to ensure that the solvent and dirt is drawn out into the pack. If this is not done, any porous surface that is not coated should be carefully sealed with plastic film to prevent solvent evaporating off from it (Williams, 1987). As the pack dries, cracks appear in it (Figure 7.6) and eventually it reaches a state where it can be simply brushed off the object. This may take two to three days, but will be longer if the pack is covered to slow the process down. If it is felt that owing to the powdery nature of this material there is a risk of leaving deposits of the pack material in cracks, a separating layer of tissue, such as Eltolene tissue, can be used between the surface of the object and the pack. New batches of any of the clays used for poulticing should be tested before use as they can occasionally be contaminated with soluble salts.

As an alternative to a clay, paper pulp can be used as a poulticing material. This is prepared by tearing acid-free blotting paper into pieces about 1 cm square and adding them to a small quantity of deionized water or other solvent in a beaker. They are left overnight and stirred to a paste-like consistency in the morning. They can then be applied to the surface of the object in the way described above for clay packs.

Almost any solvent can be used in poultice form, the choice depending on the nature of the dirt, but most success is achieved with the less volatile solvents. If water is used, it must be distilled or deionized water. White spirit is commonly used where the stains originate from greasy food.

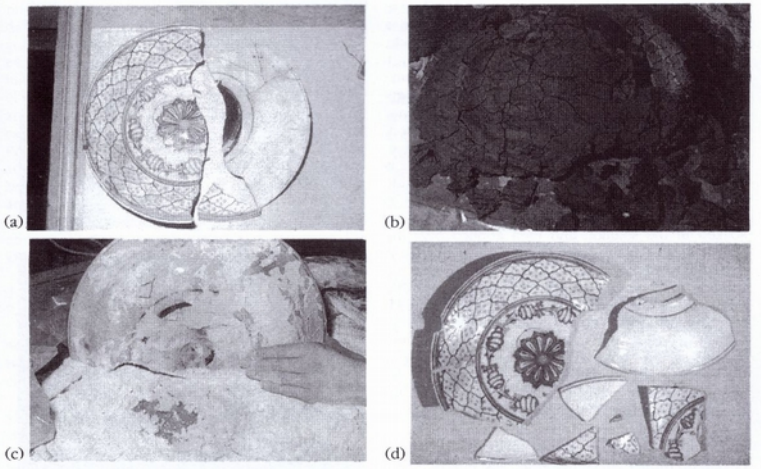
### *Alkalis*

Alkalis such as sodium carbonate and bicarbonate and sodium hydroxide can be used for removing wax and grease stains. The object or fragment should be soaked in the solution; however there is the danger that strong alkalis can affect the glaze or body after prolonged soaking. If not completely rinsed away crystals can form, damaging the glaze or body.

### *Bleaches*

Where the stain cannot be removed the alternative is to render it colourless using a bleaching agent. This is a particularly useful method for treating dirty cracks and break edges. Chlorine bleaches should be avoided as they leave chloride ions in the body of the ceramic which are very difficult to rinse out. These may cause severe damage at a later stage by crystallizing out at the surface or under the glaze, and can result in the whole object fragmenting. The safest bleaching agent to use for stains that are of an organic nature is hydrogen peroxide, from which the only residue is water. Hydrogen peroxide releases oxygen atoms which attack the part of the organic molecule that gives it colour. However, the strong oxidizing effect means that hydrogen peroxide should be used with caution on anything other than high-fired ceramic bodies as it may react with uncombined iron in earthenwares and cause iron staining. It may also affect gilding and unfired decoration, and will





(a) (b) (c) (d)

**Figure 7.6** The use of a sepiolite pack for stain removal. (a) Shows the dish before application of the pack. The base was stained with a dark brown stain. In (b) the pack, which was made up with white spirits and applied in a thick coating around all the pieces, has begun to dry and crack. In (c) the pack has dried out completely and the sepiolite is being brushed off the surface, and (d) shows the cleaned dish (Victoria and Albert Museum, London).