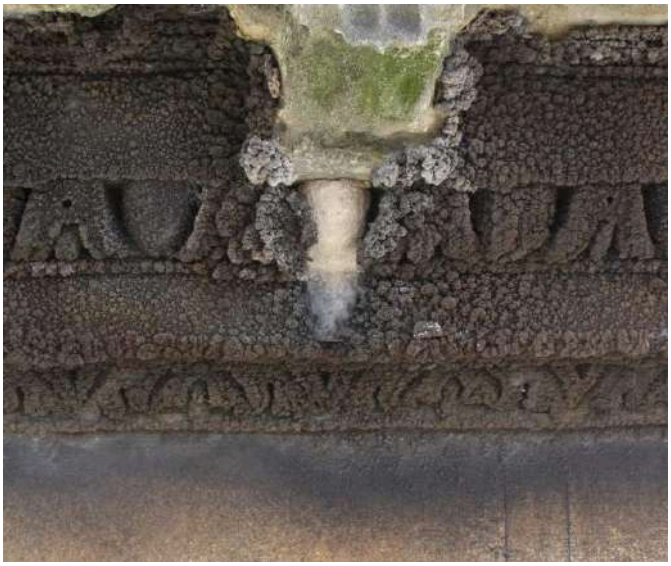
TECHNICAL INFORMATION SHEET

AMMONIUM CARBONATE POULTICE

EXPLANATION

Calcium carbonate is the principal constituent of limestone and is common to mortar, render, concrete and other masonry. Acidic sulphurous gases, released by the combustion of coal and other fossil fuels, expose the carbonate to chemical reaction. This generates Calcium Sulphate (Gypsum) which binds itself, and airborne carbon pollution particulates, to sheltered areas of the affected masonry. 'Carbon Sulphation', or 'Gypsum Crust', may accumulate from a thickness of a few microns to a 'clinker' of several centimetres.
It is possible to use a poultice (in this case more correctly termed a 'pack' or 'compress') of ammonium carbonate to convert the semi-soluble calcium sulphate to soluble ammonium sulphate.



Carbon Sulphation may accumulate in thickness from a film, to a 'clinker' of several centimetres

The chemical reaction attributed to the removal is;

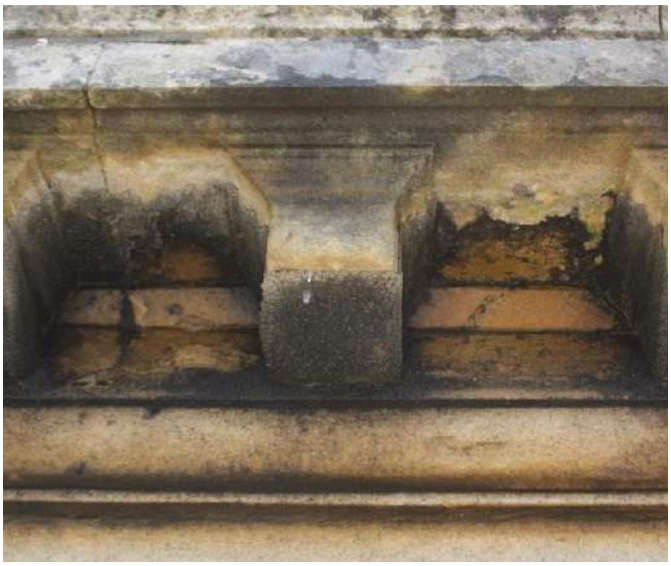
$(NH_4)_2CO_3$ Ammonium Carbonate	+	$CaSO_4.2H_2O$ Calcium Sulphate	→	$(NH_4)_2SO_4$ Ammonium Sulphate	+	CaCO3 Calcium Carbonate	+	$2H_20$ Water

Brush agitation to dislodge remaining solid matter may be required. Rinsing will be needed to remove absorbed salts not removed with the 'poultice'. Although ammonium carbonate is mildly alkaline, the byproducts can be acidic. Consequently, dwell time must be kept to the minimum necessary.

CONSTITUENTS AND MIXING

Restorative Techniques supply ready-mixed poultice to a range of strength and composition or alternatively the principal constituents 'by the bag' for self-mixing; Ammonium Carbonate, Sepiolite Clay and Arbocel Cellulose Fibre.

A range of modifiers are available including surfactant to improve 'wetting' properties and gelling agent to aid adhesion of the poultice. Precautions and PPE shall be adopted in accordance with the component H&S Data Sheets. A Product Guide is also available to help calculate the quantity and cost of the required constituents.



An example of sulphated limestone masonry prior to treatment.

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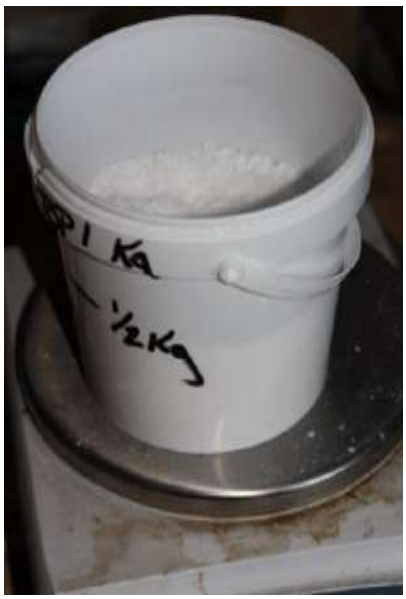
There may be found a considerable variation in recipe from one practitioner to another. The proportions, even the list of constituents, can alter including the omission of clay or paper. Mixing and use must proceed with caution. Testing must be undertaken and exemplars produced to establish the most appropriate parameters prior to large scale use. The 'strength' of the poultice is normally expressed as the percentage of ammonium carbonate in solution with water, commonly 5 - 10% by weight. Solution strength and the other parameters actually used should be recorded for later reference.

The granules of Ammonium Carbonate are dissolved in water to provide the required strength of active solution. This is mixed into a medium of clay powder, enabling a significant volume of solution to be suspended against the masonry in a controlled fashion, maintaining good capillary contact but without undue saturation.
The addition of Cellulose Fibre makes the poultice easier both to apply and remove and reduces considerably the lateral shrinkage (and cracking) of the clay as it dries. The fibre also allows the percentage of liquid within the poultice to be increased significantly whilst maintaining similar workability (stiffness).



Weight/volume calibration; Ammonium Carbonate granules are weighed and the vessel marked at the corresponding volumes.

Example: 5% Ammonium Carbonate Poultice
By weight, add 1 part ammonium carbonate powder with 19 parts water (e.g. 500g + 9.5kg water). Stir until fully dissolved. Add and 'stir-in' equal volumes of sepiolite clay and Arbocel, until the mixture is moderately stiff.
Mix ratio*: 1kg of this poultice might contain 680g water, 35g ammonium carbonate, 230g sepiolite clay,55g Arbocel fibre.
Density*: 1.2kg per litre.
Application rate*: 1.2kg per m² per mm thickness (e.g. 5mm thickness equates to 6kg per m²).

*These are approximate figures only, obtained by experiment.

APPLICATION AND REMOVAL

It is very important that test samples are first carried out that take into account the range of stone type, bedding and surface profile and the variation in chemical composition and permeability of the sulphation residue. In some circumstances excessive strength, dwell-time or number of applications can result in bleaching, alternatively of 'browning-out'. Sulphation previously overpainted or lime-washed is more difficult to soften. Thicker sulphation or lower prevailing temperature will normally require increased dwell time although the optimum is likely to remain in the range 1-24 hours. Ambient temperature should be in the range 5-25°C.

Solution Strength and **Dwell Time** shall always be kept to the minimum necessary.

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The poultice is normally pre-mixed in lidded containers and re-mixed prior to use. The masonry surface should be pre-wetted. Areas not for treatment are protected from contact with the poultice. Very heavy or nodular accumulation over simple profile might be reduced by careful hand scraping and tooling. However for finely carved or delicate masonry this should be done only after softening with the poultice.

The poultice is applied with a trowel or float to a thickness of several millimetres (usually 5-6mm), ensuring full coverage and contact with the sulphation. Alternatively it can be applied by hand, protected with a rubber gauntlet. For heavy sulphation, repeated light and mild applications and removal may be more productive than increased solution strength or thickness.

Polythene or similar is used to cover the poultice during the dwell period.

In warm weather or for longer dwell times, a protective film of polythene should be employed to prevent premature drying.

With the dwell complete, the bulk of the poultice is removed by hand and secured for disposal. The remaining sulphation is carefully scrubbed with brushes of natural or synthetic bristle before thorough rinsing with clean water. Metal wire brushes of phosphor bronze, or fine stainless steel wire may also be suitable. Ordinary steel wire, or coarse wire of any kind, shall not be permitted.