

PERFLUOROETHERS AS WATER REPELLENTS IN STONE CONSERVATION

P. Frediani, C. Manganelli, U. Matteoli, P. Tiano, F. Piacenti

C.N.R. - Centro Studi sulle Cause di Deterioramento e Metodi di Conservazione delle Opere D'Arte, Via Gino Capponi n. 9
50121 Firenze, Italy

In our search for a highly stable and efficient water repellent to be used in the conservation of stone monuments exposed in the open, we have experimented a series of perfluorinated polyethers (Fomblin Y Montedison) of different molecular weight which show interesting properties.

These products in fact have a very low chemical reactivity, a high photochemical stability, a good permeability to gases and are easily soluble in fluorinated solvents like freon, alofrene and in their lower homologues.

We have tested polyethers having m. w. 1.500 and 6.000-7.000 dissolved either in Freon or Alkofrene 113 or Fomblin D0.

Carrara marble and Pietra serena were the stones used for our tests.

The effectiveness of the treatment was tested through the following determinations :

- a) Imbibition coefficient and evaporation coefficient
- b) Permeability to water
- c) Superficial temperature and humidity with reference to the temperature and humidity of the atmosphere

The results obtained show, as could easily be foreseen, a quite different behaviour between marble and Pietra serena.

Marble has in fact a very low porosity and therefore the penetration of the water repellent is small. The determination of some of the above parameters on treated and untreated samples has therefore shown very small differences.

With Pietra serena very interesting results have been achieved when using Fomblin YR (m. w. 6.000-7.000) dissolved in Alkofrene.

After this treatment the imbibition coefficient is significantly decreased as well as the permeability to water and the ratio between the absolute superficial humidity and the absolute humidity of the ambient.

These treatments do not induce any colour change on the stone even after strong U.V. irradiation for 2 h at 40°C.

The treatment is completely reversible since these compounds may be completely removed from the surface with the appropriate solvent.

The results obtained show that perfluoropolyethers have, as water repellents on stone, an activity which is at least as good as that one shown by the best products used up to now. They show however a much higher stability which suggests for them a much longer period of activity.

This last indication is supported by the results obtained up to now in accelerated aging tests.

Even the cost of the treatment, due to the small amount of product used per unit of surface, does not seem unreasonable.