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Evaluation of Eco-compatible methodologies to clean stone surfaces polluted by oil spill

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Accidental oil spill is a serious hazard for marine ecosystem and several protocols have been developed to guarantee eco-sustainable intervention concerning sea, marine fauna and shores [1]. Architectural surfaces of historical building close to the sea might also be polluted by oil spill, with further complication due to tidal excursion, but any general rules of interventions have been developed to safeguard them and the restorers' health. The past practices based on the use of toxic solvent (e.g. toluene and other organic solvents) are not admissible anymore [1-3], but the effectiveness of more eco-compatible methods on architectural surfaces is not well known yet. This research deals with the set up of suitable methods for the removal of oil (Fuel Oil 120 cSt) from traditional bricks and Istria Stone, materials commonly found in the embankments and buildings of North Adriatic coastal cities. The use of organic solvents have been compared to methods having lower toxicity for restorers and the environment, and low dispersion (e.g. by using poulticing) [5].
Brick and Istria stone specimens were put in contact with fuel oil for different time laps; the pollution effects and the oil penetration profiles were assessed by SEM-EDX, FT-IR spectroscopy and colorimetric evaluations. Different media (cellulose-based media, bentonite), solvents (N,N-dimetylottanammide, toluene only as comparison solvent), solid adsorbents (absorbent from Sphagnum Peat Moss, Ecosorboil) and non ionic surfactants have been tested in removing the oil from the polluted specimens, both alone (by brushing the surfaces) and in combination (by poulticing). The results indicate that oil is not able to penetrate Istria stone, but it impregnates bricks for around 2 mm depth. Among the ones tested ,the most effective methodology implies brushing the absorbent from Sphagnum Peat Moss on the surface to eliminate oil excess, followed by application of N,N-dimetylottanammide mixed with a surfactant agent. The removal is not complete for bricks, but the reduction of the amount of oil and the breaking of long hydrocarbon chains accelerates the natural decomposition.

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