



Adverse effect of diesel engine produced particulate matter on various stone types and concrete: a laboratory exposure experiment

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The effect of particulate matter on construction materials have been studied under laboratory conditions. For testing the adverse effects of diesel soot and particulate matter on stone and concrete a small scale laboratory exposure chamber was constructed. Blocks of 9 different stone types and concrete was placed in the chamber and an exhaust pipe of diesel engine was diverted into the system. Tested stones included: porous limestone, cemented non-porous limestone, travertine, marble, rhyolite tuff, andesite and granite. The engine was operated for 10 hours and the produced particulate matter was diverted directly to the surface of the material specimens of 3 cm in diameter each. Working parameters of the engine were controlled; the composition of the exhaust gas, smoke value and temperature were continuously measured during the test. Test specimens were documented and analysed prior to exposure and after the exposure test. Parameters such colorimetric values, weight, surface properties, mineralogical compositions of the test specimens were recorded. The working temperature was in the order of 300°C-320°C. The gas concentration was in ppm as follows: 157 CO; 5.98 CO₂, 34.3 THC; 463 NO_x; 408 NO; 12.88 O₂. Our tests have demonstrated that significant amount of particulate matter was deposited on construction materials even at a short period of time; however the exposure was very intense. It also indicates that that the interaction of particulate matter and aerosol compounds with construction materials in urban areas causes rapid decay and has an adverse effect not only on human health but also on built structures.