

LUMINESCENCE DATING OF LIME MORTARS TO MEASURE POLLUTION RATES

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An interesting characteristic of lime mortars is that they decay when subjected to some types of air pollution. Gaseous pollutants such as CO₂ and SO₂ can cause dissolution-decarbonation-carbonation processes and sulphation of the lime binder, respectively. In fact, sulphation causes the conversion of calcium carbonate to calcium sulphate. While such processes occur in atmospheric polluted environments, particulate pollution also can be deposited and incorporated to such mortars. Thus, they can be used as pollution tracers allowing us to measure deposition rates of particulate pollutants. However, to calculate deposition rates the absolute age of the mortars must be known. In this sense, luminescence dating of mortars allows knowing the age of lime mortars. Dating mortars by luminescence involves some partially solved and unsolved problems. Luminescence dating yields the age of an object from the ratio between paleodose or cumulative radiation dose in the minerals of that material and the annual dose rate. Recent improvements in methodology, the development of optically stimulated luminescence OSL in recent years and the application of statistical tools have resulted in the first dating of lime mortars. Although early work in this area was focused on the constraints encountered in the paleodose calculation, problems related to the measurement of the annual dose also exist.

In this work mortars from old buildings and monuments have been collected from two urban sites (A Coruña, Spain, and Braga, Portugal) and dated by luminescence. This paper also presents the results of luminescence dating of mortars from buildings collected from both urban sites. Results will be discussed in relation to historical framework and in relation to pollution conditions.

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