

Marble deterioration in Chaharbagh school in Isfahan by atmospheric pollutants

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As a part of a project for studying the deterioration of archeological marble stone in Charbagh school construction in Isfahan, over 12 samples were analyzed by various analytical techniques such as X.R.F, I.C.P-A.E.S, S.E.M and X.R.D. in order to determine the elemental and mineral composition.

Charbagh school is a 16-17th century cultural complex in Isfahan. The compound was built during Soltan Hossein, a Safavid king, to serve as a theological and clerical school. The marble stone is used abundantly in this archeological buildings. However, stone can deteriorate rapidly without protection, particularly in our modern era of climate change. The three major causes of deterioration in natural marble stone are: polycrystallisation, air pollution and acid precipitation.

The analyses were carried out on different corrosion layers separately. X.R.F and I.C.P-A.E.S analyses indicated the presence of Ca, Fe, S, as the major and Si, Mg, Al, Mn, N, K, as the minor elements.

S.E.M study of the sample on secondary and backscattered electron images and also E.D.A.X point analyses could confirm the results obtained by the other methods.

According to the result obtained through analysis of various corroded layers on the sample.

XRD results showed that the samples are made of the same type of minerals: Gypsum, Goethite, ...

The effects of air pollution and acid precipitation were investigated as causing the erosion of marble.

The research indicated that the marble grains are being structurally weakened by a chemical conversion process of marble to gypsum crystals:

