

Diagnosis and cleaning using laser technology for the restoration of historical monuments

Description:

Since ancient times granite has been used in historic buildings. Some restorers used to apply molten beeswax on their granite surfaces to stop imminent deterioration of the monuments. At first, this treatment was a good solution to consolidate the stone, but with time it resulted counterproductive. This method allows removal and cleaning of wax and other contaminants from porous stones in historical monuments and artworks using non-destructive means through laser technology.

It comprises the following steps:

- Identifying contaminated regions on the porous stone document.
- Characterizing the contaminant.
- Exposing the contaminant on the porous stone monument to irradiation from a laser characterized by a wavelength, pulse length, repetition rate, and energy determined and optimized for a given contaminant porous stone system.
- Adaptively evaluating the cleaning results.

Innovative aspects and advantages:

The cleaning of artworks often involves the removal of dirt from damaged surfaces or fragile substrates. The traditional cleaning techniques such as water, chemical and mechanical cleaning can result in permanent damage. This is a non-contact, selective, and environmental friendly cleaning technique. This method, using laser technology, allows deep cleaning without causing any damage to the artwork or monument.

Commercial applications:

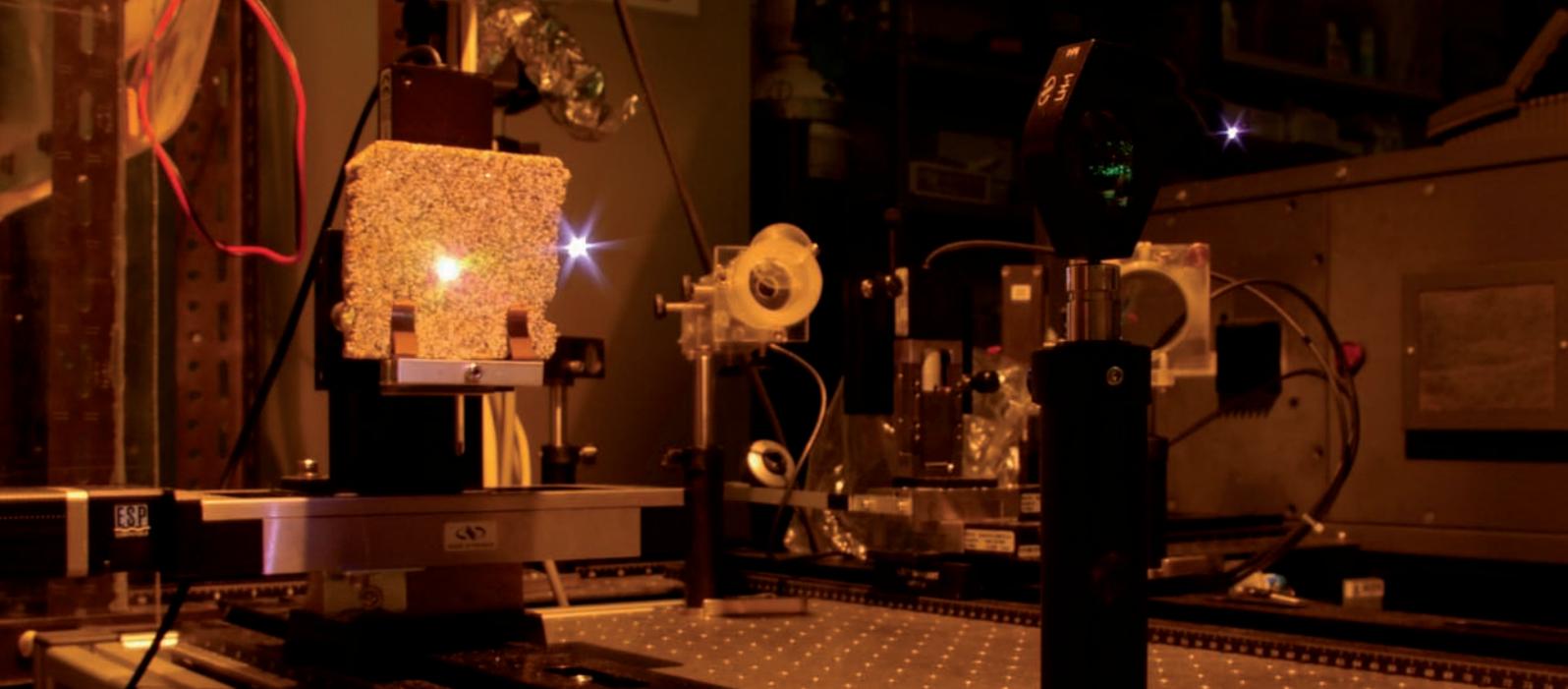
Facades and monuments cleaning. Public administration, restorers, cleaning companies.

Origin of the invention:

Research project: "Laser cleaning in the Galician Cultural Heritage conservation: Removal of beeswax on granite surface". Regional R&D Funds, Xunta de Galicia.

State of art:

As a proof of concept a prototype has been successfully utilised on porous stone from the Cathedral of Santiago de Compostela cloister.



Publications:

- A. Pan, S. Chiussi, J. Serra, P. González, B. León, "Calibration of Raman spectroscopy at 1064 nm for beeswax quantification", Applied Spectroscopy 61 (11), 2007, pp. 1259-1264.
- A. Pan, S. Chiussi, J. Serra, P. González, B. León, "Excimer Laser Removal of Beeswax from Galician Granite Monuments", Journal of Cultural Heritage 10 (1), 2009, pp 48-52
- A. Pan, E. Rebollar, J. Carlos Conde, F. Lusquiños, S. Chiussi, B. León, "Experimental and theoretical study of the Nd:YAG laser removal of beeswax on galician granite at 355 nm", Applied Physics A 100 (2010) pp. 741-746.
- A. Pan, S. Chiussi, J. Serra, P. González, B. León, "Comparative evaluation of UV-VIS-IR Nd:YAG laser cleaning of beeswax layers on granite substrates", Applied Surface Science, 257 (2011) pp 5484-5490.

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