

Substitute for ethylene oxide gas to be used in the disinfection of cellulosic materials

Study of the fungicide properties of a specific gas (cyanogen, CN-CN)
on several different strains of mildew isolated on cellulosic materials

Schedule: research began in 2006 and is to be completed in 2009

Programme description

For more than 30 years, heritage objects, and in particular graphic works (books and archival documents) contaminated with mildew have been disinfected with ethylene oxide.

Over the last several years, researchers have begun to experiment with possible alternatives, including gamma rays, electron beams and supercritical carbon dioxide. Due to the deterioration in materials brought on by all of these methods, none of them has been considered as satisfactory.

The CICRP has launched a study of a new gas that might be used as a substitute for ethylene oxide, cyanogen (CN-CN), on 14 mildew strains isolated from cellulosic materials.

The aim of this study is to achieve satisfactory disinfection effectiveness on all strains tested, by determining the optimal concentration time product (in g.h/m³) for this gas, without causing deterioration, either over the short or long term, of the cellulosic materials.

The initial results obtained indicate satisfactory effectiveness of the gas on 13 of the 14 strains tested. The adjustment of relative humidity (from 65% to 80%) improves the results obtained and under these conditions, only one strain remains resistant to the treatment (*N. fischeri*). Using this approach, the papers tested do not show any yellowing visible with the naked eye or deterioration and even demonstrate quantifiable reinforcement, when tested for mechanical resistance.

A complementary study, in which only the relative humidity was varied, allowed for the refinement of the treatment conditions, the purpose being to subject documents to the lowest possible relative humidity.

New tests are to be performed, testing relative humidity rates of 70%, 75% and 80%.

Accelerated ageing of papers treated will enable the innocuousness of the gas to be verified in relation to possible long-term deterioration and paper resistance.

Partners

Centre de Recherche en Physique Appliquée à l'Archéologie (C.R.P.2.A.) and Bibliothèque Nationale de France (Marne-la-Vallée): Deterioration analysis

Laboratoire National des Denrées Stockées (I.N.R.A.) and Application Techniques Hydrauliques SA (Bordeaux): Preparation of disinfection protocols and gas analysis (gas dynamics during experiments)

Institut Universitaire de Technologie (I.U.T.) of Avignon (Bioengineering Department): Analysis of microbiological effectiveness
Publication

An article is in preparation, due to be published in the journal Restaurator in 2008.