

Organizers:



REHABEND 2016

Euro-American Congress

CONSTRUCTION PATHOLOGY, REHABILITATION TECHNOLOGY AND HERITAGE MANAGEMENT

Burgos (Spain) - May 24th-27th, 2016

Sponsor entities:



REHABEND 2016

**CONSTRUCTION PATHOLOGY, REHABILITATION TECHNOLOGY AND
HERITAGE MANAGEMENT**

(6th REHABEND Congress)

Burgos (Spain), May 24th-27th, 2016

PERMANENT SECRETARIAT:

UNIVERSITY OF CANTABRIA

Civil Engineering School

Department of Structural and Mechanical Engineering

Building Technology R&D Group (GTED-UC)

Avenue Los Castros s/n 39005 SANTANDER (SPAIN)

Tel: +34 942 201 738 (43)

Fax: +34 942 201 747

E-mail: rehabend@unican.es

www.rehabend.unican.es

REHABEND 2016

ORGANIZED BY:



UNIVERSITY OF CANTABRIA (SPAIN)
www.unican.es // www.gted.unican.es



UNIVERSITY OF BURGOS (SPAIN)
www.ubu.es

CO-ORGANIZERS ENTITIES:



UNIV. ARGENTINA JOHN F. KENNEDY (ARGENTINA)



UNIV. ESTADUAL PAULISTA "JÚLIO DE MESQUIDA FILHO" (BRAZIL)



UNIVERSIDAD AUSTRAL (CHILE)



TECNALIA (SPAIN)



UNIVERSIDAD DEL PAÍS VASCO (SPAIN)



UNIVERSIDAD POLITÉCNICA DE CATALUÑA (SPAIN)



POLITÉCNICO DI BARI (ITALY)



UNIV. MICHOACANA SAN NICOLÁS HIDALGO (MEXICO)



UNIV. NACIONAL AUTÓNOMA (MEXICO)



PONTIFICIA UNIVERSIDAD CATÓLICA (PERU)



UNIVERSIDADE DE AVEIRO (PORTUGAL)



UNIV. DE LA REPÚBLICA (URUGUAY)



UNIVERSITY OF MIAMI (USA)

CONFERENCE CHAIRMEN:

LUIS VILLEGAS
JUAN MANUEL MANSO

CONGRESS COORDINATORS:

IGNACIO LOMBILLO
JOSÉ MANUEL GONZÁLEZ
JOSÉ ANTONIO MARTÍNEZ
HAYDEE BLANCO
YOSBEL BOFFILL

EDITORS:

LUIS VILLEGAS
IGNACIO LOMBILLO
HAYDEE BLANCO
YOSBEL BOFFILL

INTERNATIONAL SCIENTIFIC ADVISORY COMMITTEE:

HUMBERTO VARUM – UNIVERSITY OF AVEIRO (PORTUGAL)
PERE ROCA – TECHNICAL UNIVERSITY OF CATALONIA (SPAIN)
ANTONIO NANNI – UNIVERSITY OF MIAMI (USA)

The editors does not assume any responsibility for the accuracy, completeness or quality of the information provided by any article published. The information and opinion contained in the publications of are solely those of the individual authors and do not necessarily reflect those of the editors. Therefore, we exclude any claims against the author for the damage caused by use of any kind of the information provided herein, whether incorrect or incomplete.

The appearance of advertisements in this Scientific Publications (Printed Abstracts Proceedings & Digital Book of Articles - REHABEND 2016) is not a warranty, endorsement or approval of any products or services advertised or of their safety. The Editors does not claim any responsibility for any type of injury to persons or property resulting from any ideas or products referred to in the articles or advertisements.

The sole responsibility to obtain the necessary permission to reproduce any copyright material from other sources lies with the authors and the REHABEND 2016 Congress can not be held responsible for any copyright violation by the authors in their article. Any material created and published by REHABEND 2016 Congress is protected by copyright held exclusively by the referred Congress. Any reproduction or utilization of such material and texts in other electronic or printed publications is explicitly subjected to prior approval by REHABEND 2016 Congress.

ISSN: 2386-8198 (printed)

ISBN: 978-84-608-7940-4 (Printed Book of Abstracts)

ISBN: 978-84-608-7941-1 (Digital Book of Articles)

Legal deposit: SA - 132 - 2014

Printed in Spain by Gráficas Iguña, S.A.

| | |
|---|------------|
| Introduction..... | 3 |
| Previous Congresses..... | 4 |
| Sponsor & Collaborating Entities..... | 5 |
| International Scientific Committee..... | 8 |
| Topics | 12 |
| Abstracts of the Congress | 13 |
| 1.- Previous Studies..... | 33 |
| 1.1.- Multidisciplinary studies (historical, archaeological, etc.) | 35 |
| 1.2.- Heritage and territory | 55 |
| 1.3.- Urban regeneration | 61 |
| 1.4.- Economical and financial policies | 72 |
| 1.5.- Social participation processes and socio-cultural aspects in rehabilitation projects | 75 |
| 1.6.- Construction pathology | 80 |
| 1.7.- Diagnostic techniques and structural assessment (no destructive testing, monitoring and numerical modeling) | 118 |
| 1.8.- Guides and regulations | 170 |
| 2.- Project | 177 |
| 2.1.- Theoretical criteria of the intervention project | 179 |
| 2.2.- Traditional materials and construction methods | 184 |
| 2.3.- Novelty products applicable and new technologies | 198 |
| 2.4.- Sustainable design and energy efficiency | 224 |
| 3.- Building Intervention | 251 |
| 3.1.- Intervention plans | 253 |
| 3.2.- Rehabilitation and durability | 258 |
| 3.3.- Reinforcement technologies | 270 |
| 3.4.- Restoration of artworks | 282 |
| 3.5.- Conservation of industrial heritage | 283 |
| 3.6.- Examples of intervention | 289 |
| 4.- Maintenance | 315 |
| 4.1.- Construction maintenance | 317 |
| 4.2.- Preventive conservation of built heritage | 323 |
| 5.- Diffusion and Promotion | 327 |
| 5.1.- Heritage and cultural tourism | 329 |
| 5.2.- Teaching and training | 331 |
| 5.3.- New technologies applied to the heritage diffusion | 339 |
| 5.4.- Accessibility to cultural heritage | 341 |
| 5.5.- Built heritage management | 344 |

CODE 3.2.06**PERFORMANCE OF WOOD IMPREGNATED WITH ALKOXYSILANES****Canosa, Guadalupe^{1,2*}; Alfieri, Paula²; Caprari, Juan¹; Giudice, Carlos¹**

1: Universidad Tecnológica Nacional (UTN)

e-mail: guadalupecanosa@yahoo.com.ar

2: Centro de Investigación y Desarrollo en Tecnología de Pinturas (CIDEPINT)

KEYWORDS: Wood, alkoxy silane, decay resistance, dimensional stability, fire.**ABSTRACT**

The wood, very heterogeneous and complex material, changes its volume by water absorption or desorption causing swelling or shrinkage and also it can be degraded both by action of microorganisms and fire; the above-mentioned is a great inconvenient for most commercial uses.

Solid wood specimens of *Araucaria angustifolia* were impregnated with alkoxy silanes hydrolyzed and condensed "in situ" by the sol-gel process. Alkoxy silanes selected were aminopropyl methyl diethoxy silane and aminopropyl triethoxy silane; it was also used the aminopropyl methyl diethoxy silane/aminopropyl triethoxy silane mixture in 50/50 w/w ratio. The pH was adjusted to alkaline value for controlling kinetic of hydrolysis and condensation reactions.

Impregnation process was carried out at 45–50 °C in an autoclave, controlling the operating conditions for achieving different weight gains.

Unmodified and modified wood specimens were exposed to brown rot (*Polyporus meliae*) and white rot (*Coriolus versicolor*) under laboratory conditions.

The results indicate that the improved resistance to fungal exposure would be based on the wood chemical modification (the protection of cellulose caused by steric hindrance of $\equiv\text{Si-O-Cellulose}$ preventing the formation of enzyme-substrate complex). Moreover, the results also would be based on the enhanced dimensional stability of the treated wood; the quoted high dimensional stability, which limits the growth of the spores, is supported in the hydrophobicity generated by both the decreasing of the amount of polar hydroxyl groups and the partial occupation of pores with polysiloxanes.

Fire laboratory tests were carried out in Two-Foot Tunnel (flame spread index, panel consumption and smoke density) and in TGA detector (mass loss).

The performance can be explained according the reactivity of the alkoxides; the results indicate that as weight gain increase the performance of impregnants against fire also does.