HMC 2016

4th Historic Mortars Conference

Scientific Program

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Santorini, Greece

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Dept of Civil Engineering
Aristotle University of Thessaloniki

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11:00 - 11:30	**Coffee break**	
11:30-13:15	**Session X / Repair mortars for historic masonry** Hall A **Chair**: Rob Van Hees, Ana Velosa	**Session XI / Repair mortars for historic masonry** Hall B **Chair**: Suzana Slizkova, Ana Radivojevic
11:30 - 11:45	**Wood ash as an Additive: a Study of its Influence on the Physical Properties of Lime Mortars**, Lucie Fusade, Heather Viles	**Restorative Waste-based Lime Mortars with Inclusion of Spent Cooking Oils,** Parsa Pahlavan, Stefania Manzi, Maria Chiara Bignozzi
11:45 - 12:00	**The use of a lignosulfonate superplasticizer in repair air lime-metakaolin mortars**, M. Pérez-Nicolás, A. Duran, R. Sirera, I. Navarro-Blasco, J.M. Fernández, J.I. Alvarez	**Experimental study of bond strength developed between traditional type bricks and lime-based repair mortars,** Dimitris Papadimitriou, Ioanna Papayianni
12:00 - 12:15	**Behaviour of air lime-metakaolin mortars modified with polynaphthalene sulfonate as superplasticizer**, A. Duran, R. Sirera, M. Pérez-Nicolás, I. Navarro-Blasco, J.M. Fernández, J.I. Alvarez	**Mechanical and durability properties of lightweight mortars for the backing of ancient mosaics**, Sabina Kramar, Martina Lesar-Kikelj
12:15 - 12:30	**Preliminary study on the use of ammonium phosphate for the conservation of marble-imitating gypsum-stuccoes**, Enrico Sassoni, Gabriela Graziani, George W. Scherer, Elisa Franzoni	**Fiber- reinforced lime mortars**, Maria Stefanidou, Michael Papachristoforou, Fotini Kesikidou
12:30 - 12:45	**Pompeian stucco plaster without aggregates: a case study of reconstruction**, Christian Kaiser, Katrin Wilhelm, Ronja Emmerich	**Comparative study for water protection of traditional packed floor mortars,** Katia Matziaris, Maria Stefanidou, George Karagiannis
12:45 - 13:15	Discussion	Discussion

The use of a lignosulfonate superplasticizer in repair air lime-metakaolin mortars

M. Pérez-Nicolás[1], A. Duran[1], R. Sirera[1], I. Navarro-Blasco[1], J.M. Fernández[1], J.I. Alvarez[1]

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A superplasticizing admixture of natural origin, lignosulfonate (LS), was incorporated to air lime mortars sometimes modified with a pozzolanic additive, metakaolin, to obtain a new range of repair mortars to be applied in Built Heritage.

LS improved the flowability of the air lime samples and showed good slump retention over time: for example, after 150 minutes of the air lime pastes preparation, blends with LS lost only ca. 13% of the slump value. Experimental results showed that LS interfered with the carbonation due to its ability to form Ca^{2+} complexes.

Adsorption isotherms and zeta potential measurements showed that LS was scarcely adsorbed onto lime and C-S-H particles. Due to its branchy structure, LS exhibited an adsorption mechanism leading to steric hindrance as the main responsible mechanism for avoiding flocculation. The presence of free LS molecules in the dispersion was seen to improve the plasticizing effect of this polymer. Flexural and compressive strengths as well as the durability in the face of freezing-thawing cycles of these mortars were also determined to assess the applicability of these repair mortars.

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Introduction

- **Dispersing admixtures** are the so-called plasticizers which have a **water reducing action** on cement materials.
- When plasticizers are added, **workability (*i.e.* fluidity)** at a constant water/cement ratio **is improved**.
- **Higher fluidity** than that of the plain mortar paste can be reached with the **use of small concentration of these admixtures**.
- As a consequence of the reduction of the mixing water **higher mechanical strengths** can be obtained.

Introduction

- The **interaction of the plasticizer molecules with the solid particles**, causes a **dispersing action**, which has been claimed to be responsible for the **increase in fluidity of the paste**.
- Interaction can take place:
  - either by **modifying the surface charge** (zeta , ζ, potential) upon **adsorption** onto the particles, thus increasing the **electrostatic repulsion**,
  - or by **steric hindrance**.

Introduction

- The widespread use of hydrated lime and pozzolan-hydrated lime pastes for paints, consolidant products, soil treatments and the obtaining of repair mortars and grouts, especially for architectural monuments of the Cultural Heritage, supports the interest of these materials. **In the case of grouts, one of the most relevant features is to achieve a suitable flowability** that allows the grout to fill voids providing a good continuity of the masonry system

Introduction

- It is also well-known **Metakaolin, MK**, exhibiting pozzolanic behaviour, reacts in alkaline media with slaked lime particles, giving rise to the **formation of C-S-H and C-A-H** and, therefore, leading to a **compressive strength increase.**
- The **interaction between the plasticizer and the particles of the binder** could be affected by the presence of **MK**
- Thus, the **role of these plasticizers in the presence of pozzolanic additives** needs to be **studied**.

Conclusions

- **The flowability** of the fresh lime mortar **improves** after the incorporation of the **LS**.
- **LS** showed a **large dispersing capability over the time**.
- **LS** was **not highly adsorbed** onto **lime and C-S-H particles**, its **action** being **based**, mainly, on **steric hindrance**.
- **Mechanical strengths and durabilities of LS-MK-limes were appropriate** for its use in **grouts** and other applications in which requirements are not highly stringent.