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# ChemCH 2014

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## **Book of Abstracts**

(edited by Rita Wiesinger and Manfred Schreiner)

## A NEW CONSERVATION TREATMENT FOR STRENGTHENING AND DEACIDIFICATION OF PAPER USING POLYSILOXANE NETWORKS

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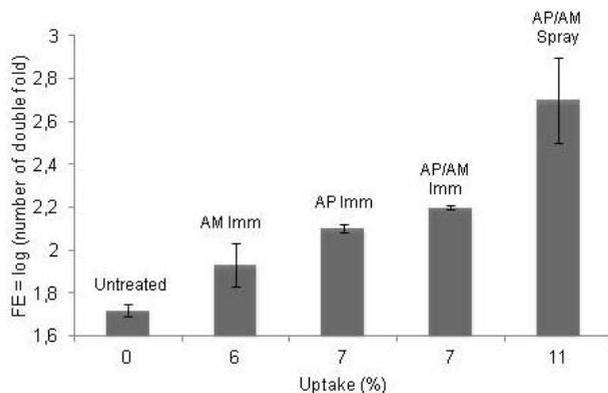
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Acidity is the main factor in the deterioration of paper, resulting in a loss of material and of the information conveyed. Current methods for the stabilization and mass treatment of paper are based on the neutralization of acids and deposition of a mineral buffer, called alkaline reserve, in the fibrous network. This treatment helps the paper fighting future acidity arising during the natural aging process.

The aim of our research is to develop a stabilization methodology allowing simultaneous deacidification and fiber strengthening. This novel preservation strategy for acidic and fragile paper especially targets documents that are currently banned from public access because of their poor physical condition. In previous publications, a multifunctional solvent phase process based on various polysiloxanes with amine functionality (aminoalkylalkoxysilanes) was studied as an alternative for libraries and archives [1-3]. Deacidification is ensured by the amine function and reinforcement is effected by *in-situ* polymerization in the paper of the polysiloxane in ambient conditions.

In this work we propose the use of a di-alkoxysilane, with (AMDES, aminopropylmethyl-diethoxysilane) an amine function, and a tri-alkoxy aminosilane (APT-



FE (log number of double folds) measurements for untreated paper and paper treated with polyAMDES (AM), polyAPTES (AP) and polyAPTES/polyAMDES (AP/AM) applied by immersion (Imm) and spray

ES, aminopropyltriethoxysilane), as well as their copolymer (polyAPTES/polyAMDES) as fibers strengthening agents in a model paper made of pure cellulose [4]. In all the cases where APTES was present, networks formed. This was established by measuring the soluble fraction amount extracted from the treated papers. A slight decrease

of the opacity of the paper sheets was noted when AMDES was part of the treatment. However, the presence of APTES restored the initial opacity. The study of the physicochemical properties of the treated paper (mechanical strength and alkalinity) demonstrated that, besides the deacidification feature, the different treatments allowed an efficient strengthening of the cellulose fibers to various extents. For example, the results of folding endurance show that the pure cellulose papers, whether treated by immersion or spray, undergo moderate to large improvement of their double fold resistance (FE), indicating an increase of flexibility and plasticity. Contact angle measurements indicated an increase of the hydrophobic character of paper treated with the treatments containing APTES. These results were consistently obtained in both spray and immersion treatment processes.

The treatments were also applied on other model papers, containing various amounts of lignin and thus closer in composition to newsprint papers. Indeed, lignin, a natural polymer, is often responsible for the acidification of paper over time.

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