

Study of the interactions and reactions in naturally aged newsprint papers strengthened with polysiloxane copolymer networks

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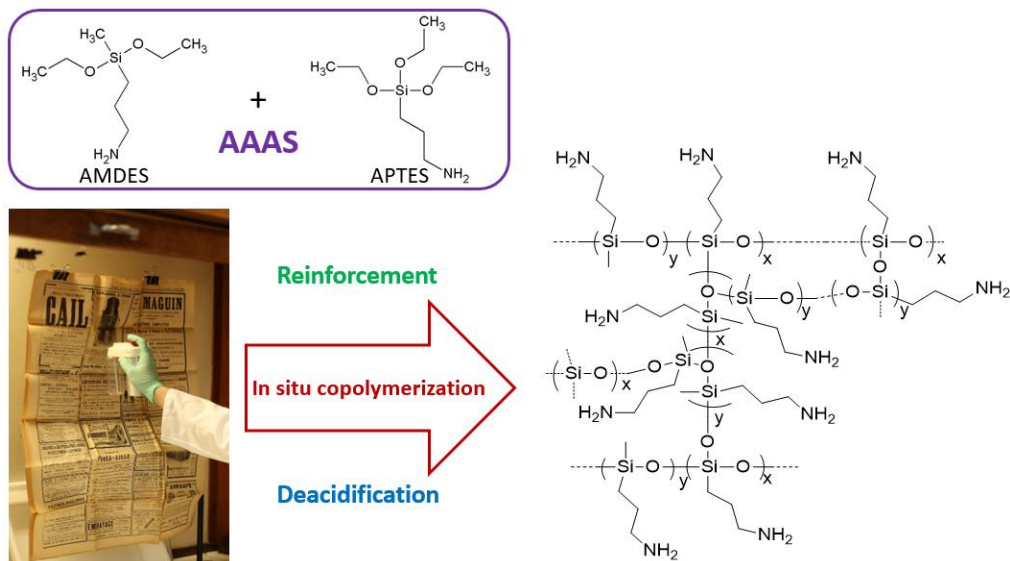
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Natural ageing of paper is responsible for its slow decay. Late 19th and early 20th century lignocellulosic paper collections of mediocre quality, especially newsprint papers, are often in poorer conservation state than medieval handmade rag papers. In order to find a conservation solution for Libraries and Archives collection keepers, CRC and LPPI have developed novel one-pot treatments based on the use of copolymerized aminoalkylalkoxysilanes (AAAS) that allow the simultaneous deacidification and strengthening of cellulosic objects of the cultural heritage [1].

Several paper constituents are thought to affect the efficiency of the copolymer treatment under study, including papermaking additives. In particular, alum-rosin sizing, and the presence of mechanical pulp [2,3], which contains copious amount of lignin, a biopolymer largely responsible for the acidity of early industrial paper, are thought to play an adverse role. Nuclear Magnetic Resonance (NMR) and Fourier-transform infrared (FTIR) spectroscopies were used to investigate the interactions and the reactions occurring between the AAAS and the paper at room temperature. Several model molecules that mimic the main organic functions on cellulose and lignin were brought into contact with AMDES (*3-aminopropylmethyldiethoxysilane*). The aim was to better understand the possible interactions between the biomacromolecules and the AAAS treatment by focusing on key characteristic functional groups.

In parallel to the study with molecular models, copolymerized AAAS were sprayed on naturally aged newsprint papers from the early 20th century. The *in situ* copolymerization was studied using Solid-state ²⁹Si MAS NMR. The data was compared to data formerly obtained with a newsprint paper treated in 2015 with the same copolymers mixture. This allowed the long term monitoring of the polymerization in ambient conditions when the AAAS are in contact with lignocellulosic paper.



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