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CELLULOSE-BASED MATERIALS –  
FROM SCIENCE TO TECHNOLOGY

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**A chemoenzymatic toolbox for the covalent immobilization of functional proteins on paper**

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**Abstract**

The generation of bioactive papers is of growing scientific interest, in particular for use in low-equipped analytical testing devices.<sup>[1]</sup> The conjugation of a sensor molecule on the paper surface is especially important for bioanalytical applications. Conventional conjugation strategies result in random orientation of the proteins on the fibers, which may affect their performance in a negative way.<sup>[2]</sup>

Herein, we report several straightforward and efficient approaches for the grafting of functional proteins onto paper in a directed spatial orientation. The synthetic strategy is of modular nature. It relies on a functionalization of cellulose with a linker molecule, carrying a peptidic recognition sequence. Site-specific protein attachment is realized subsequently using enzyme-mediated transamidation reactions. Taking place under physiological conditions the reactions leave the protein structure, hence activity, intact.<sup>[3]</sup> Being site-directed it could be applied to a vast number of functional proteins leading to tailor-made constructs, e.g. for applications in paper-based diagnostics. The strategy is exemplified by the coupling of turboGFP, microbial transglutaminase and ZZ-protein as model structures.





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**Biography**



**Valentina Liebich** is currently working on her Ph.D. thesis within the group of Prof. Dr. Harald Kolmar at TU Darmstadt in the field of applied biochemistry. Her work focusses specially on mild bioconjugation strategies for the immobilization of functional proteins on paper fibers. When not working in the lab, she enjoys outdoor activities with friends and family.