From cellulose to functional materials for sensors and CE separations

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Gold statement
- Learn about thermal treatment of cellulose
- Discuss applications of thermal treatment for sensors
- provide information related to the use of pyrolyzed cotton as adsorbent

Introduction
Cellulose is one of the most abundant organic materials on the planet. It is the main constituent of plant fibers and its hydrophilic properties, chemical reactivity, surface functionality and mechanical strength can provide a versatile substrate for the development of analytical processes. Among other modifications, thermal treatment of cellulose starts by the release of water and the formation of various reactive aldehydes. Exposing these substrates to higher temperatures can lead to carbonization and subsequent the formation of graphitic structures with significantly different properties.

Body
Here, applications of thermal treatment of paper (performed with a CO2 laser) will be briefly discussed to illustrate the versatility of the process [1-2]. Then, the application of a more aggressive process, leading to the formation of hydrophobic structures from cotton will be presented [3]. Taking advantage of the inherent affinity of proteins for hydrophobic surfaces, the material was used to facilitate the analysis of protein-containing samples by capillary electrophoresis. The material retains enough flexibility so it can be placed directly into the sample vials and has enough capacity to capture more than 75% of the proteins in the sample (1% dilution of 1 mL of serum). The advantages of the material are demonstrated by performing the analysis of five representative drugs (in serum) by capillary electrophoresis obtaining a change in migration time of only 5 ± 1%, after 10 consecutive runs.

Conclusion
The possibility to transform cellulose into functional materials was discussed, along with several strategies to tune the selectivity of the process.

References
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[2] K. Clark, *Soft Matter* **16** (2020) 7640-7640
[3] P. Reed, *Analytica Chimica Acta* **1110** (2020) 90 - 97