

Turning ordinary paper into (electro)chemical sensors

Prof. Dr. Thiago Regis Longo Cesar da Paixão*

University of São Paulo, Chemistry Institute, Av. Prof. Lineu Prestes, 748
Butantã, 05508-900 - São Paulo, SP - Brazil

Abstract: Since 2007, Whitesides' group opened a new research field in analytical chemistry, the development of easy-to-use analytical devices to provide quick and simple diagnostics on paper [1]. The potential of paper for in-field analysis is unquestionable because they allow sophisticated laboratory instruments to be replaced with portable detectors. Since 2010 [2], electrochemical detectors, instead of visual reporters, were attached to the paper analytical devices with good synergism. Different approaches [2] have been used to fabricate electrochemical paper-based analytical devices (ePADs): drop-casting, inkjet printing, and silk screen/screen printing procedures. Other fabrication methods including the use of graphite leads or direct pencil drawing [2], as well as, wire or fiber attachment on paper have been also proposed. However, these procedures are usually performed manually causing a lack of reproducibility or exhibiting sluggish heterogeneous electron transfer to some electroactive compounds. Hence, we are suggesting the use of laser scribing technique using a CO₂ laser to developed a simple, fast, single-step, and green method to scalable fabrication of ePADs by direct laser scribing on paper [3], converting the cellulose in carbon by pyrolysis, and other inexpensive substrates. Additionally, we are also proposing the use of laser scribing procedure to perform an surface treatment of the ePADs fabricated by the direct pencil drawing procedure. The potential of ePADs fabricated using both procedures were evaluated for different analytical applications.

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* e-mail: trlcp@iq.usp.br, <http://www2.iq.usp.br/docente/?id=trlcp>