ANALYSIS OF WATER-SOLUBLE VITAMINS IN BIOPHARMA RAW MATERIALS BY ELECTROPHORESIS MICRO-CHIPS WITH CONTACTLESS CONDUCTIVITY DETECTION

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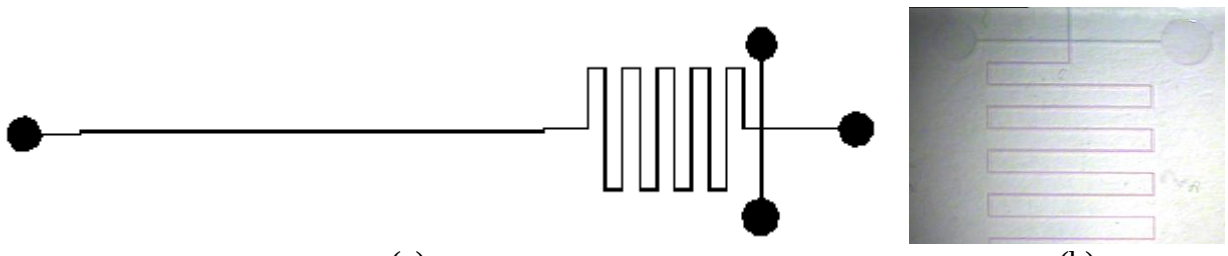
Detailed information concerning the composition of the raw materials employed in the production of biologics is important for the efficient control and optimization of bioprocesses. The analytical methods used in these applications must be simple and fast as well as be easily transferable from one site to another. In that context, microchip-based electrophoresis represents a promising tool for application in the analysis of raw materials in biologics. Using electrophoresis micro-chips, analysis times can be reduced to seconds and high separation efficiencies can be achieved using extremely low volume samples, minimal reagent consumption and waste generation, low cost/disposability, portability and ease of mass-production [1].
Additionally the use of Capacitively Coupled Contactless Conductivity Detection (C^4D) offers a rather simple and yet sensitive method for detection of ionic species. Recently, C^4D has gained much popularity as on-chip detection in electrophoresis micro-chips [2]. The main reason for this is that there is no physical contact of the detection electrodes with the electrolyte solution. Therefore, the integration of this detection mode within the analytical system is rather simple. Furthermore, the background noise is significantly reduced leading to lower detection limits than the conventional contact conductivity detection.

Vitamins are present at very low concentrations in biopharma raw materials and are usually determined using HPLC and CE methods [3]. Electrophoresis micro-chips are a very good alternative to these techniques due to the shorter analysis time and yet very good resolution, among others.

In this paper, we present the application of electrophoresis micro-chips with C^4D detection to the analysis of water-soluble vitamins in raw materials used for the production of biologics in bioreactors. For that purpose, hybrid PDMS/glass chips were fabricated by using standard photolithographic techniques (Figure 1). The chip structure contains an extremely long channel of 101 mm (50 x 50 μm width x depth). Figure 2 shows the setup used for vitamins detection.



(a) (b)

Figure 1. a) CAD design of the electrophoresis micro-chip; **b)** Picture of the meanders of the hybrid PDMS/glass micro-fluidic device filled with a pink dye.

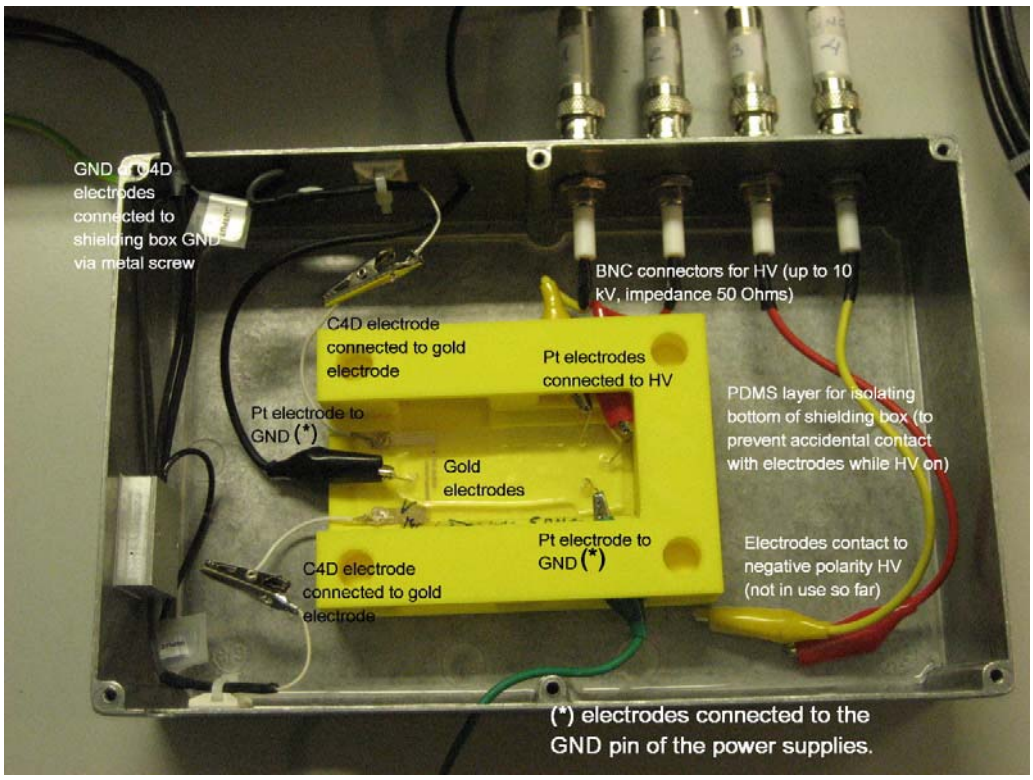


Figure 2. In-house electrophoresis microchip system setup.

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[2] P. Kubáň, P. C. Hauser, Electroanalysis 2004, 16, 2009.
[3] Marszall, M. L., Lebiedzinska, A., Czarnowski,W., Szefer, P., J. Chromatogr. A 2005, 1094, 91–98.

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