

Versatile Continuous pH Monitoring Barcode System Based in Ionogels

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The online monitoring of pH level in different environments like bio-engineering [1] and chemistry [2] is vital for the control and well behaviour of the whole industrial process. Still exist the demand of miniaturised, versatile and autonomous systems which do not require of sensor calibration, replacement and manual attention over a long operational interval. In this abstract we present an innovative miniaturisable system for continuously measurement of pH solutions and vapours streams during chemical or biological processes. It consists on a simple barcode sensor with several pH dyes doped in an ionogel matrix.

This ionogel is a hybrid material fabricated from an hydrogel polymer (*N*-isopropylacrylamide and *N,N*-methylene-bis(acrylamide) ratio 100:5) and an ionic liquid (Trihexyltetradecylphosphonium dicyanoamide). The barcode sensor consists of nineteen independent micro-wells (1×20 mm by 50 μm) fabricated in poly(methyl methacrylate) and pressure-sensitive adhesive in three layers using a CO₂ ablation laser. Different optically responsive molecular recognition ligands (pH-dyes) were incorporated in the ionogel matrix during monomers photo-polymerisation within each of the micro-wells generating a pH-sensor array for specific sensing applications like colorimetric, environmental or chemical sensing, Figure 1. It was observed that no leaching of pH dyes occurred during experiments and that the ionogel material was impressively robust under harsh conditions (pH:1 to pH: 14).

The result is a sensing barcode which is able to generate a characteristic fingerprint-type colour of response within a single “snapshot” for different pH solutions and vapours. Moreover the pH response can be monitoring continuously and the barcode is reusable at least fifty times without sensitivity withdrawing.

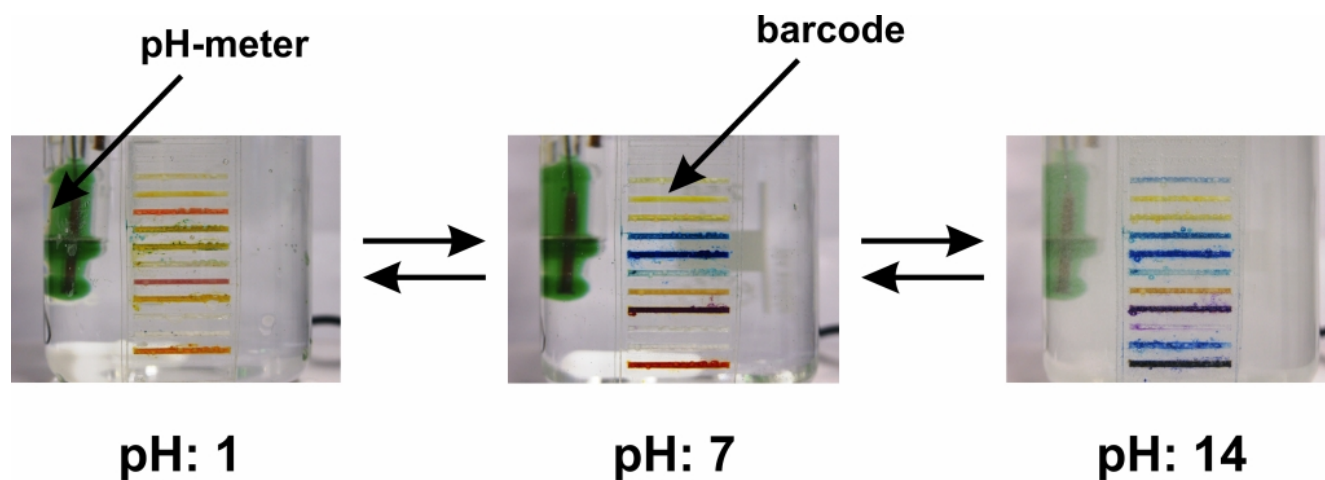


Figure 1: Snapshots of the barcode during continuous pH monitoring of a water solution (pH range: 1-14).

[1] M-H Wu *et al.* Biomedical Microdevices (2009) 11, 265–273.

[2] M. Blumentritt *et al.* Sensors and Actuators B (2008) 131, 504–508.