

Technická zpráva – Funkční vzorek

Autoři: Jiří Janouš, Dalimil Šnita, Jiří Lindner

Umístění: Vysoká škola chemicko technologická v Praze

Název: Plastový mikrofluidický mikročip s lineárním polem zlatých elektrod pro elektrochemická měření v proudu tekutiny

Description

Universal microfluidic sensor with a gold microelectrode array has been developed. The system is made of PMMA plastic by means of UV lithography and galvanic electroplating to assure a low manufacturing cost. The sensor design allows the simple integration of control electronics in the vicinity of the sensor which lowers the noise of the already weak signal. Layout of the sensor can be easily altered by the use of other lithographic mask. Therefore a high variability in use for many different analytical methods is achieved. From all possible applications we are heading for conductivity measurement, voltammetry, membranes and two phase flow characterization

Fabrication

The microfluidic sensor consists of four parts (Fig. 1): (i) PMMA plate with embedded golden microelectrodes, (ii) connection blocs (Fujipoly), (iii) PMMA counterplate with microfluidic and support structures, (iv) commercially sold printed circuit (Roth elektronik) with soldered connection pads. Microfluidic part is made by micromiling cutter, while the golden electrodes are made by a specific combination of UV lithography and galvanic electroplating technology.

The method of electrode fabrication based on sacrificed substrate includes following steps: (i) UV lithography on phosphor-bronze substrate coated with a positive resist, (ii) galvanic deposition of gold in the developed patterns, (iii) photoresist stripping, (iv) embedding gold structures into UV curable PMMA resin Acrifix[®] 192 (Degussa), (v) phosphor-bronze etching. Depth of the deposited gold pattern is approximately 5 μm .

In the next step, the PMMA surface of the electrode plate is treated with UV/O₃, and then pressed and thermally bonded with the counter-plate at the assistance of an organic solvent. The resulting plastic part is clenched together with the bottom part using special connection rubber blocks in between. These blocks contain a line of through-going golden wires with 100 μm spacing. When pressed, the wires stab into the metal on both sides and form a solid connection. Current design contains an array of 28 single wired electrodes, but this amount can be doubled when necessary.

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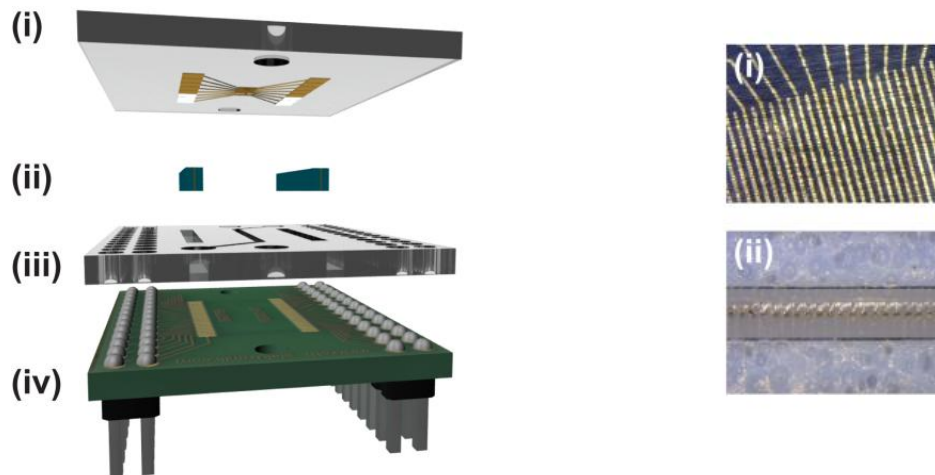


Fig. 1 Scheme of the sensor: (i) PMMA plate with golden electrodes array, (ii) connection blocs, (iii) microfluidic PMMA counter-plate, (iv) printed circuit with connection pads

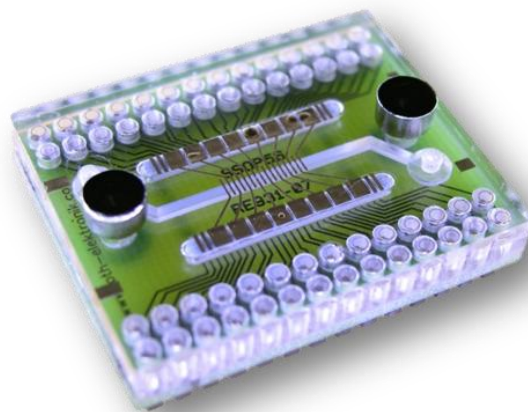


Fig. 2 Photo of the final sensor