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3D-printed lab-on-valve for fluorescent determination of cadmium and lead in water

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Abstract

In recent years, the development of 3D printing in flow analysis has allowed the creation of new systems with various applications. Up to now, 3D printing was mainly used for the manufacture of small units such as flow detection cells, preconcentration units or mixing systems. In the present study, a new 3D printed lab-on-valve system was developed to selectively quantify lead and cadmium in water. Different technologies were compared for lab-on-valve 3D printing. Printed test units have shown that stereolithography or digital light processing are satisfactory techniques for creating complex lab-on-valve units. The lab-on-valve system was composed of two columns, eight peripheral ports and a central port, and a coil integrating baffles to increase mixing possibilities. A selective extraction of lead was first carried out by TrisKem Pb™ Resin column. Then, cadmium not retained on the first column was extracted on a second column of Amberlite® IR 120 resin. In a following step, lead and cadmium were eluted with ammonium oxalate and potassium iodide, respectively. Finally, the two metals were sequentially detected by the same Rhod-5N™ fluorescent reagent. This 3D