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DEVELOPMENT OF NEW SOLID-PHASE MICROEXTRACTION FIBERS BASED ON MOF-199

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Wide application and rapid development of solid-phase microextraction (SPME) has opened up new challenges for researchers. The development of new SPME fibers has attracted more attention due to limited types of commercially available fibers [1] and inherent shortcomings such as low extraction effectiveness of polar compounds [2], selectivity [3, 4], thermal stability (240-280°C) [5] and possible swelling upon exposing to some organic solvents [6]. In recent years, there has been an increased interest in the design of SPME fibers based on metal organic frameworks (MOFs), which are promising SPME coating materials due to their permanent porosity, large surface area, high mechanical and thermal stability [7].

The objective of this study was to develop new SPME fiber based on MOF-199 by *in-situ* solvothermal method using stainless-steel substrate. According to X-ray diffraction patterns (Fig.1, a), MOF-199 based fibers were successfully synthesized. Scanning electron microscopy images showed that using the increase of ethanol concentration from 75 to 96.5% resulted in a decrease of particle size from 6-19 µm to 1-6 µm, which improved the mechanical stability of the coating on the stainless-steel substrate. Increasing synthesis time to 16 h allowed achieved the homogeneity of MOF-199 coating. Results of thermogravimetric analysis proved its thermal stability up to 297°C in N_2 atmosphere (Fig.1, c).

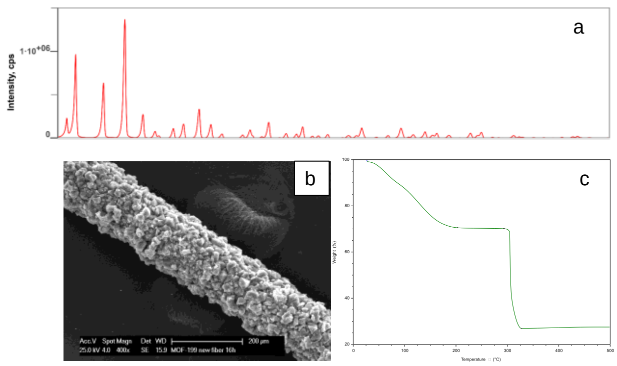

Fig.1. MOF-199 sample's XRD pattern (a), SEM image (b) and TGA curve (c)

Extraction effectiveness of the developed SPME fiber (Fig.1, b) was tested on 25 volatile organic compounds (VOCs) from air samples and compared with a commercially available SPME fibers – 65-µm polydimethylsiloxane/divynilbenzene (PDMS/DVB) and 85-µm carboxen/polydimethylsiloxane (Car/PDMS). Responses of 16 VOCs (out of 25) using MOF-199 were 1.9-82.3 times higher compared to PDMS/DVB fiber, while responses of 5 VOCs using MOF-199 and CAR/PDMS fibers were similar. The developed MOF-based SPME fiber provided a great performance for low molecular VOCs.

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