Design of fiber-optic Raman sensor using metal-organic frameworks

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Relevance and purpose
Fiber sensor for the selective detection of hazardous impurities in gases and liquids provides real-time monitoring of their concentration in constantly running industrial and environmental processes. Identification of impurities using Raman peaks in the spectrum determines the high sensitivity of the method, and the fiber design of sensors ensures the flexibility and safety of their use.

Zeolitic imidazolate frameworks (ZIFs) are a class of metal-organic frameworks (MOFs) that are topologically isomorphic with zeolites. MOFs, known for their large surface areas, extensive porosities, and tailorability, have been widely studied as gas storage materials and catalysts [1].

Conclusion
• The Raman spectroscopy method makes it possible to analyze the uniformity of ZIF8 deposition on the fiber surface, when it cannot be visually distinguished. On the recorded spectra from the fiber surface, the signals of the material of the quartz fiber and the deposited ZIF8 material are separated. Therefore, based on the presence of Raman peaks from MOF, one can conclude that it is located at the recorded point.
• It was formulated method of controlled etching of optical fiber for further deposition of MOFs on the fiber core.

References