

ANALYTE FOCUSING AND ENRICHMENT ON GAS CHROMATOGRAPHY COLUMN

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The objective of this work was to design, construct and test sample focusing and concentration enrichment device for gas chromatography (GC). Gas chromatography is one of the most popular analytical methods in the world, widely used for analysis of different organic compounds. Many researchers use GC method every day; however they face problems of separation, lack of sensitivity or difficult sample preparation. There were many attempts to improve GC method and one of them was to construct different modules [1, 2], that would solve one or few of these problems. Our device is designed based on cryofocusing principles [3] and was constructed in-house. Using our prototype, we aimed to improve both sensitivity and resolution of separation using GC system.

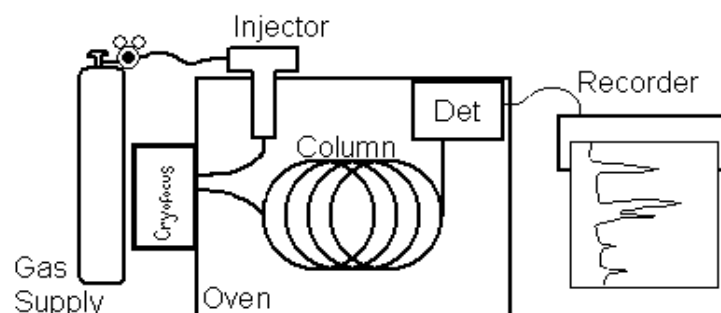


Fig. 1. Gas chromatography systems with focusing module scheme

Normally mixture of analytes is injected in gas chromatography system and then they are separated on GC column and detected using a detector. Using our prototype device, after injection analytes were stopped briefly to focus them and then continued traveling along the column to a detector. Analyte peaks became up to 37% narrower and up to two times higher just after one focusing cycle. That is significant improvement of the resolution and sensitivity of the analysis. Also this device could be used for the concentrating of the analytes on the column. Analytes moving through GC column are retained in the enrichment zone of our prototype. Consecutive injections could be made till certain amount of the analyte will be collected and then all this amount will be released to move further through the column at the same time. Number of injections correlate with the signal increase. In our testing we managed to get up to 20 times higher peak areas after 20 consecutive injections.

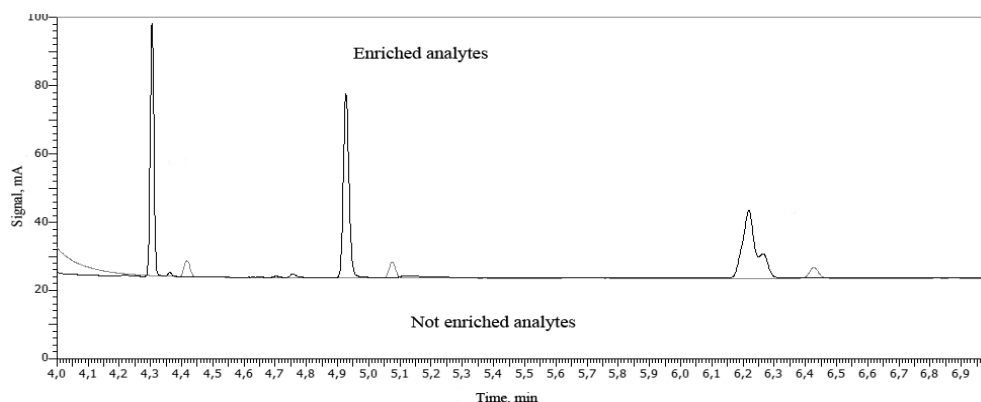


Fig. 2. Enriched (tall peaks) and standard (small peaks) chromatograms compared.

These results are just the beginning of our work in this topic and we will continue to improve this system.

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- [1] Wilson, R. B. *et al.* High-speed cryo-focusing injection for gas chromatography: Reduction of injection band broadening with concentration enrichment. *Talanta*, 97, 9–15, 2012
 - [2] Chin, *et al.* Universal Method for Online Enrichment of Target Compounds in Capillary Gas Chromatography Using In-Oven Cryotrapping. *Analytical Chemistry*, 83(17), 6485–6492, 2012
 - [3] Falaki, Foujan. "Sample Preparation Techniques for Gas Chromatography. *Gas Chromatography-Derivatization, Sample Preparation, Application*. IntechOpen, 2019