The surface chemistry and topography of the material in contact with LC-MS/MS and DART-MS/MS systems.

The modified coatings were evaluated in term of biocompatibility, reproducibility and extraction efficiency. For automated 96-well plates, the modified coating was used for extraction of whole blood and extraction spot (EBS) analysis. The extracted blood spot (EBS) analysis using SPME coating was coupled with LC-MS/MS and DART-MS/MS systems.

Introduction

The surface chemistry and topography of the material in contact with whole blood extraction method.

The study showed that PAN-modified C18-PAN coating (UV dried) resulted in less biocompatibility and reusability.

The modified PAN-C18-PAN was used for whole blood extraction and extracted blood spot (EBS) analysis.

The phenomena of protein adsorption and cellular adhesion are two different issues which should be resolved using biocompatible coating. High temperature and drying, or dipping may influence the properties of proteins and cells. The aim of the present study was to achieve high through flow for whole blood extraction and resulted in less protein adsorption and cellular adhesion.

The modified coating could improve biocompatibility and to prevent blood cell attachment in whole blood matrix for long term use. For this purpose, this study reports on modification of biocompatible extractive phases or modification of the coating to prevent protein adsorption and cellular adhesion on the surface of the coating. This may cause adverse influence on the kinetics of extraction and loss of efficiency of the coating.

Main advantages of extracted blood spot (EBS) coating


Experimental

Coating preparation procedures

Coating extraction procedure

The procedure of the modified coating was used in LC-MS/MS and DART-MS/MS systems (see Table 2). The original C18-PAN were modified with the following procedure:

A novel improvement on biocompatibility and reusability of solid phase microextraction coatings for direct extraction from raw blood

Fatemeh Mirmaghi and Janusz Pawliszyn
University of Waterloo, Waterloo, Canada

The modified C18-PAN was used for whole blood extraction and extracted blood spot (EBS) analysis.

The study reports on improvement of biocompatibility and reusability of a biocompatible coating in whole blood extraction and extracted blood spot (EBS) analysis.

This diphenyl modified C18-PAN-UVDip performed well for 30 extractions from whole blood without any blood cell attachment. This coating could be used for both direct extraction in whole blood extraction and extracted blood spot analyses. This study demonstrates the considerable advantages including preextraction and per-extraction of analytes, and minimizing the matrix effect. It can be applied as an alternative for direct blood spot sampling and can be coupled with LC-HRMS or DART-MS for analysis. DART is a fast method of analysis which provides direct detection of chemicals without requiring sample pre-treatment, and it is applicable to a wide range of analytes. The combination of EBS with DART present significant advantages including minimizing the matrix effect which leads to more relative-quantitative results.

References


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The authors thank Innosea, Inc. for the DART system, PAS technology for the deposition of PAN, and Piranha Technology Inc. for its collaborative work. The authors also thank the Natural Sciences and Engineering Research Council (NSERC) for financial support.

Table 2: Biocompatibility and reusability for whole blood analysis

<table>
<thead>
<tr>
<th>Coating</th>
<th>Blood spot volume</th>
<th>Extraction #</th>
<th>Wash time</th>
<th>Extraction time</th>
<th>Recovery%</th>
<th>Rs%</th>
<th>LOD</th>
<th>LC-MS/MS</th>
<th>DART-MS/MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bare mesh</td>
<td>5 µL</td>
<td>1</td>
<td>5 min</td>
<td>83</td>
<td>97</td>
<td>0.3</td>
<td>0.1</td>
<td>5 µL</td>
<td>71</td>
</tr>
<tr>
<td>PAN-modified C18-PAN coated mesh</td>
<td>5 µL</td>
<td>1</td>
<td>5 min</td>
<td>83</td>
<td>97</td>
<td>0.3</td>
<td>0.1</td>
<td>5 µL</td>
<td>71</td>
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<td>0.3</td>
<td>0.1</td>
<td>5 µL</td>
<td>71</td>
</tr>
<tr>
<td>PAN-modified C18-PAN coated mesh</td>
<td>5 µL</td>
<td>10</td>
<td>5 min</td>
<td>83</td>
<td>97</td>
<td>0.3</td>
<td>0.1</td>
<td>5 µL</td>
<td>71</td>
</tr>
<tr>
<td>PAN-modified C18-PAN coated mesh</td>
<td>5 µL</td>
<td>30</td>
<td>5 min</td>
<td>83</td>
<td>97</td>
<td>0.3</td>
<td>0.1</td>
<td>5 µL</td>
<td>71</td>
</tr>
</tbody>
</table>

Across all data sets, the LOD is calculated using 10% S/N. The LOD is calculated using 3.3 S/N.

Conclusion

The modified C18-PAN was used for whole blood extraction and extracted blood spot (EBS) analysis. The extracted blood spot (EBS) analysis using SPME coating was coupled with LC-MS/MS and DART-MS/MS systems.

The phenomena of protein adsorption and cellular adhesion are two different issues which should be resolved using biocompatible coating. High temperature and drying, or dipping may influence the properties of proteins and cells. The aim of the present study was to achieve high through flow for whole blood extraction and resulted in less protein adsorption and cellular adhesion.