



A93 Present Status of Gas Chromatographic Stationary Phases Being Used in Forensic Science

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After attending this presentation, attendees will have a better understanding of how the different stationary phases used in gas chromatography (GC) are being applied to separating various analytes encountered in forensic science laboratories.

This presentation will impact the forensic science community by providing information on the different gas chromatographic stationary phases available and how they are being utilized for the separation of analytes in different matrices found in forensic science.

GC is a separation technique that has been used in most analytical laboratories for over 50 years. Most crime laboratories, especially those performing toxicological and controlled substance analysis have at least one gas chromatograph in their laboratory. To date, there has not been a survey of GC users specifically targeted at the forensic sciences. *LCGC North America* magazine has published surveys in 1990, in 1995, and in 2003 of GC users in the chemical industry.¹⁻³ Several changes have occurred in the industry and in forensic science since these surveys. For example, many environmental laboratories, which at one time represented one-third of all analytical laboratories that used gas chromatographic columns, have been closed. In recent years, many pharmaceutical laboratories have also closed or consolidated resources, outsourcing much of their analytical work outside the United States. In addition, there are now more forensic laboratories performing GC and GC-mass spectrometry (GC/MS) than there were 20 years ago. In 1995, forensic laboratories only represented 2.6% of the laboratories surveyed and in 2003 the forensic laboratories representation increased to 6%.^{2,3} The increased prevalence of gas chromatographic instrumentation in the crime laboratories is directly attributed to the reduced cost and availability of instrumentation, particularly the table-top gas chromatograph-mass spectrometer (mass detector). New manufacturers of gas chromatographic columns and new and improved column technology have also emerged, making a larger variety of stationary phases available.

With all of these changes taking place and new designer drugs challenging controlled substance and toxicology laboratories daily, it was thought that a survey of the use of gas chromatographic stationary phases for different applications would be of interest to the forensic community. Surveys were mailed to over 100 random selected crime laboratories and forensic scientists around the country. The results of these surveys will be presented. In addition to the surveys, the application of GC and GC/MS in recent proficiency tests was also investigated. Finally, the forensic science literature was searched from 2007–2012 to assess the use of different stationary phases, the technical specifications of the columns, and how each were applied to separate various analytes found in forensic samples, i.e., various drugs and toxins of interest in controlled substance and toxicological analysis, fire debris samples, pyrolysis GC, etc. Not surprisingly, preliminary results indicate that capillary columns are overwhelmingly being used in crime laboratories. Columns of 0.2 to 0.25- and 0.32mm i.d. in a range of lengths of 12 to 30-m lengths are the most popular. 100% Methylsilicone, 5% phenylmethylsilicone, polyethylene glycol, and 50% phenylmethylsilicone continue to be the most popular stationary phases.

References:

1. Majors RE. *LCGC North America* 1990;8(6):442-5.
2. 1995 Gas Chromatography User Study. Edison, NJ: Advanstar Communications, 1995.
3. 2003 Gas Chromatography User Study. Edison, NJ: Advanstar Communications, 2003.

Forensic Science, Gas Chromatography, Stationary Phases