

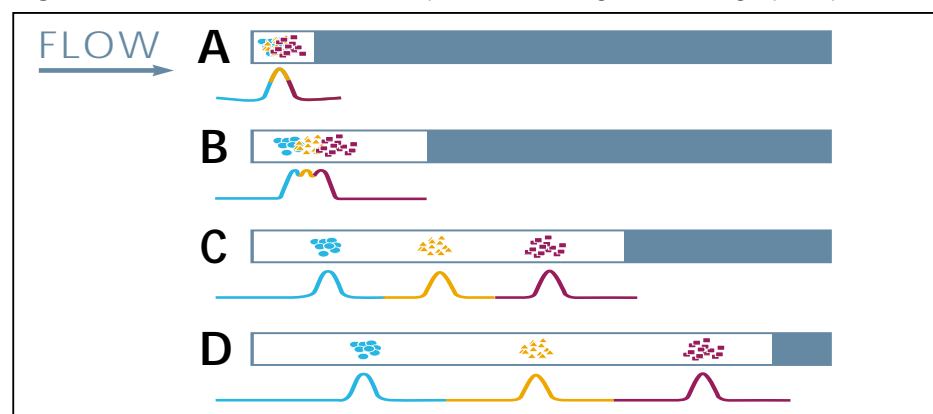
# MODIFIED POLYSILOXANES AS STATIONARY PHASES IN GAS CHROMATOGRAPHY

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## INTRODUCTION

Gas chromatography is a powerful analytical separation technique for volatile organic compounds. The solute sample is introduced into a capillary column and is swept by a stream of inert gas, typically helium, hydrogen or nitrogen. Sample components separate as the sample passes through the column by boiling point or by the degree of specific interactions between the sample and the functional groups of the polymeric stationary phase which is coated on the inner walls of capillary columns.<sup>1</sup> A typical separation process and the representation of the coated fused silica tubing are schematically drawn in **Figure 1** and **Figure 2**.

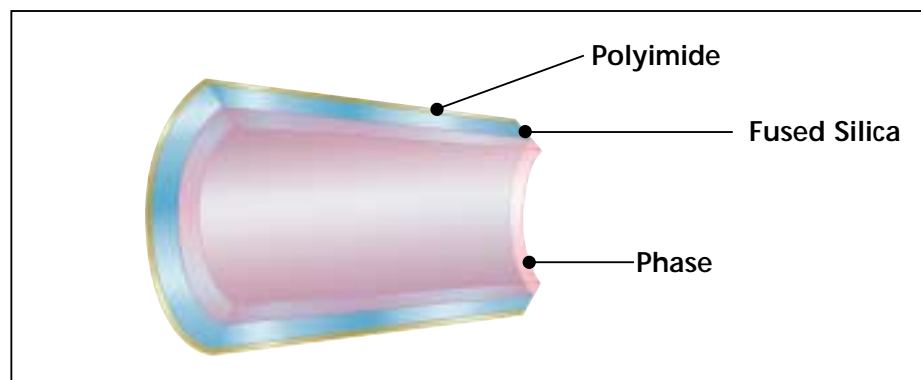
**Figure 1** Distribution of the components during chromatographic process.<sup>2</sup>



Polymeric stationary phases must meet the following criteria to be useful for capillary columns:

- **Thermal stability**
- **Physical stability**
- **Degree of crosslinking**
- **Partitioning capability**
- **Chemical inertness**
- **Phase selectivity**
- **Polymer synthesis reproducibility**

**Figure 2** Representation of fused silica tubing coated with polyimide with polymeric stationary phase applied to the inner walls.

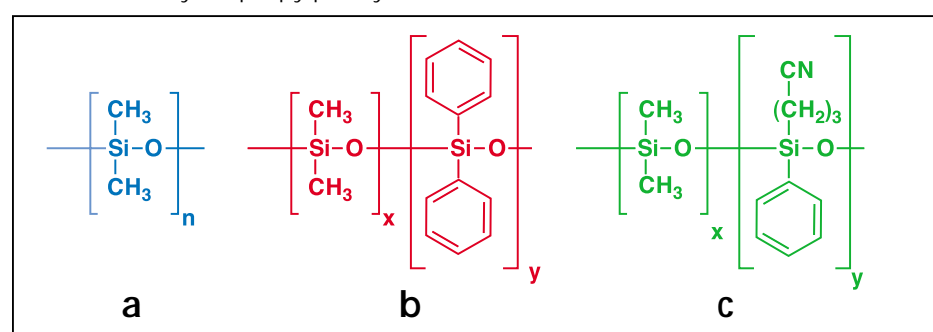


## CONVENTIONAL APPROACH

The following are the most commonly used siloxane stationary phases:

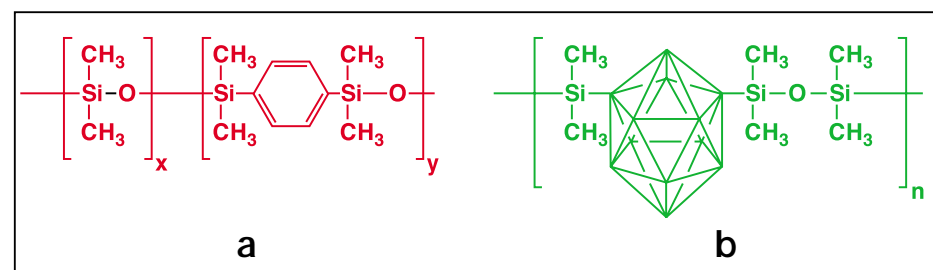
- **Side chain (methyl, phenyl or cyano) functionalized polysiloxanes**

**Figure 3** Siloxane based polymers **a** dimethyl, **b** diphenyldimethyl or **c** cyanopropylphenyl siloxanes.



- **Silarylene or carborane incorporated into the polysiloxane backbone**

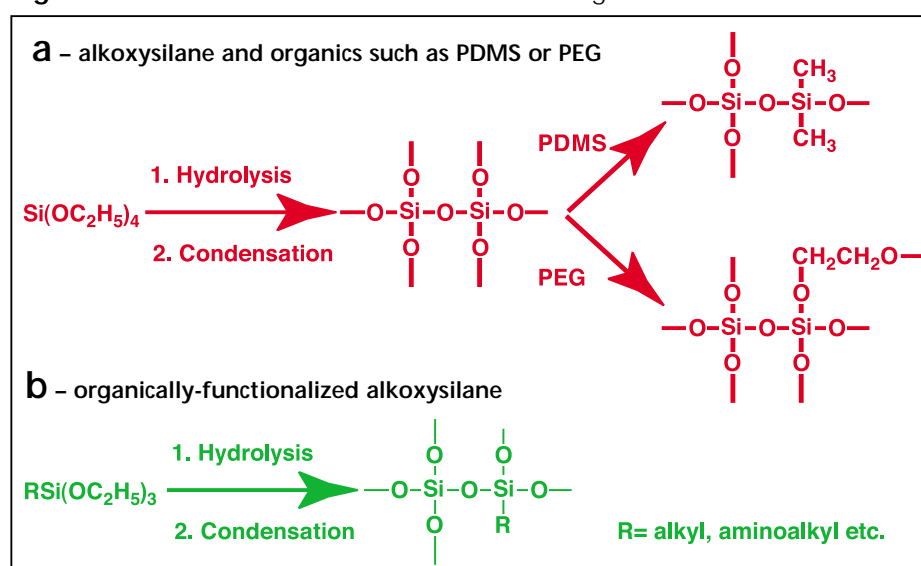
**Figure 4** Structure of **a** silphenylene and **b** carborane based polysiloxanes.



## SOLGEL APPROACH

Stationary phases based on sol-gel materials were utilized in GC chromatography to produce capillary columns that are **inherently inert, thermally stable with very low bleed, having excellent partitioning capabilities** of either non-polar or polar columns and **bonds strongly to the surface of fused silica**.

**Figure 5** General scheme for formation of sol-gel material.



## CONCLUSION

Conventional and sol-gel based polymeric siloxane materials are used as stationary phases in GC. According to their structure, they are suitable as apolar, moderately or polar phases to perform in, for example, environmental food, petroleum and pharmaceutical analyses.

## References

1. P.J. Baugh, Gas Chromatography: A Practical Approach, IRL/Oxford University Press, Oxford (1993).
2. SGE internal publications.



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