Technical Overview

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What Causes Spots on PLOT Columns? Will It Affect the Performance of the Column?

Spots on porous layer open tubular (PLOT) columns are caused by small voids in the stationary phase coating inside the tube. These spots are areas where there is an uneven coating or lack of phase. It is normal to find some voids in the phase coating of PLOT columns.

The stationary phase in PLOT columns is an opaque, solid, and porous material. In many Agilent PLOT columns such as the GS-Alumina phases, molecular sieves, porous polymers (Q and U), and the GS-OxyPLOT, the stationary phase is visible as a white powder.

For many PLOT columns, the stationary phase fill solution is a viscous suspension of particles that are less than 10 microns in diameter. The phase is coated using a dynamic process in which a plug of fill solution is pushed through the tubing, and the plug's speed and viscosity determines the thickness of the stationary phase layer. Once the PLOT's stationary phase is deposited, it is held in place by electrostatic charge, chemical interactions between particles, and/or binding agents. In wall-coated open tubular (WCOT) columns, stationary phases such as polysiloxanes or polyethylene glycols are immobilized by chemical bonding to the glass surface and cross-linking between polymer strands. Because this type of bonding and cross-linking is not possible with PLOT phases, the result is a stationary phase layer that is both fundamentally different and inherently less stable in PLOT columns than in WCOT columns.

Therefore, some voids in the phase coating of PLOT columns are virtually inevitable. Agilent tests each individual column, and all column performance specifications must be met before any column can be shipped to a customer. PLOT columns receive visual inspections to see that they meet rigorous standards at multiple checkpoints in the manufacturing and testing process. The number of acceptable voids depends on the stationary phase and column dimensions.

After passing the visual examination, columns are tested against the tightest QC performance specifications in the industry for efficiency, retention, selectivity, and bleed.

In summary, some voids in the phase coating of a PLOT column are acceptable, as long as the column is individually tested and verified to exhibit the correct chromatographic performance for that product. Agilent guarantees product reliability and performance with a 90-day warranty for all GC columns.

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