

Calculate Ligand Density of a Bonded Phase of an HPLC Column - Tech Information

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Calculating Ligand Density for Cogent Columns

Ligand density is a key parameter that reflects how much bonded phase is present on the surface of the silica in an HPLC column. For Cogent columns, we calculate ligand density using the Berendsen-de Galan equation:

$$\alpha = \frac{106 \times \%C}{(102 \times MW_{\text{carbon}} \times n_C - \%C \times MW_{\text{ligand}}) \times S_{\text{BET}}}$$

$$\alpha = (102 \times \text{M W carbon} \times n C - \% C \times \text{M W ligand}) \times S \text{ BET} 106 \times \% C$$

Where: α = Ligand density ($\mu\text{mol}/\text{m}^2$)

- $\%C$ = Percent carbon content of the bonded phase
- MW_{carbon} = Molecular weight of carbon (12.01 g/mol)
- nC = Number of carbon atoms in the bonded ligand
- MW_{ligand} = Molecular weight of the bonded ligand (g/mol)
- $SBET$ = Specific surface area of the silica (m^2/g)

This equation accounts for the carbon contribution from the ligand and the silica surface area to estimate how densely the ligand is bonded.

Example:

Using this method, the **Cogent UDC-Cholesterol™** stationary phase has a calculated ligand density of approximately **1.5 $\mu\text{mol}/\text{m}^2$** , indicating a well-covered and stable bonded phase.

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