Calculate ligand density of a bonded phase of an HPLC column - How To

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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:

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

α = (102 × M W carbon × n C − % C × M W ligand) × S BET106 × % C

Where:**α** = Ligand density (µmol/m²)

- **%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 (m²/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 µmol/m²**, indicating a well-covered and stable bonded phase.

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