Description:
Sigma Retention Index Standard consists of a mixture of aliphatic hydrocarbons ranging from C8 through C32, dissolved in hexane. It is designed to be used to obtain Kovats-type gas chromatographic retention indices, which are useful for preliminary identification of unknowns and as an aid in GC method development. Components with carbon numbers that are a multiple of five are at 2X concentration to allow easy determination of carbon numbers for peaks of interest.

Composition:
All components used are 98+% pure and are dissolved in GC grade Hexane at the nominal concentrations listed below:

<table>
<thead>
<tr>
<th>Component</th>
<th>µg/mL</th>
<th>Component</th>
<th>µg/mL</th>
<th>Component</th>
<th>µg/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Octane (C8)</td>
<td>1000</td>
<td>n-Hexadecane (C16)</td>
<td>1000</td>
<td>n-Tetracosane (C24)</td>
<td>1000</td>
</tr>
<tr>
<td>n-Nonane (C9)</td>
<td>1000</td>
<td>n-Heptadecane (C17)</td>
<td>1000</td>
<td>n-Pentacosane (C25)</td>
<td>2000</td>
</tr>
<tr>
<td>n-Decane (C10)</td>
<td>2000</td>
<td>n-Octadecane (C18)</td>
<td>1000</td>
<td>n-Hexacosane (C26)</td>
<td>1000</td>
</tr>
<tr>
<td>n-Undecane (C11)</td>
<td>1000</td>
<td>n-Nonadecane (C19)</td>
<td>1000</td>
<td>n-Heptacosane (C27)</td>
<td>1000</td>
</tr>
<tr>
<td>n-Dodecane (C12)</td>
<td>1000</td>
<td>n-Eicosane (C20)</td>
<td>2000</td>
<td>n-Octacosane (C28)</td>
<td>1000</td>
</tr>
<tr>
<td>n-Tridecane (C13)</td>
<td>1000</td>
<td>n-Heneicosane (C21)</td>
<td>1000</td>
<td>n-Nonacosane (C29)</td>
<td>1000</td>
</tr>
<tr>
<td>n-Tetradecane (C14)</td>
<td>1000</td>
<td>n-Docosane (C22)</td>
<td>1000</td>
<td>n-Triacontane (C30)</td>
<td>2000</td>
</tr>
<tr>
<td>n-Pentadecane (C15)</td>
<td>2000</td>
<td>n-Tricosane (C23)</td>
<td>1000</td>
<td>n-Dotriacontane (C32)</td>
<td>1000</td>
</tr>
</tbody>
</table>
Calculations:
A retention index value may be calculated for a peak by comparing its retention characteristics to those of the two closest eluting components in the RETENTION INDEX STANDARD, analyzed under identical conditions, using equations such as those found below.\textsuperscript{1-2} Presumptive identifications can often be made by comparing the Retention Index value to a value previously determined by you or values published in various literature references.\textsuperscript{3-7}

\[
I = 100 \left[ z + \frac{\log t'_{Ri} - \log t'_{Rz}}{\log t'_{(z+1)} - \log t'_{Rz}} \right] \\
I^T = 100 \left[ \frac{t^T_{Ri} - t^T_{Rz}}{t^T_{R(z+1)} - t^T_{Rz}} + z \right]
\]

where:  
\(I\) = retention index for isothermal GC analysis  
\(I^T\) = retention index for temperature programmed GC analysis, constant heating rate  
\(t'_{Ri}\) = adjusted retention time of sample peak\textsuperscript{*}  
\(t'_{Rz}\) = adjusted retention time of n-alkane peak eluting immediately before sample peak\textsuperscript{*}  
\(t'_{R(z+1)}\) = adjusted retention time of n-alkane peak eluting immediately after sample peak\textsuperscript{*}  
\(z\) = carbon number of n-alkane peak eluting immediately before sample peak  
\(t^T_{Ri}\) = retention time of sample peak  
\(t^T_{Rz}\) = retention time of n-alkane peak eluting immediately before sample peak  
\(t^T_{R(z+1)}\) = retention time of n-alkane peak eluting immediately after sample peak  
\*Note: adjusted retention time = peak retention time minus retention time of an unretained peak

Examples:
Isothermal analysis
Sample peak = 2.55 min. Unretained peak (air, methane, etc.) = 0.70 min.  
C18 peak = 2.16 min.  
C19 peak = 2.81 min.

\[
I = 100 \left[ 18 + \frac{\log (2.55 - 0.70) - \log (2.16 - 0.70)}{\log (2.81 - 0.70) - \log (2.16 - 0.70)} \right] = 1864
\]

Temperature programmed analysis

\[
I^T = 100 \left[ \frac{12 .60 - 12 .25}{12 .93 - 12 .25} + 18 \right] = 1851
\]

Sample peak = 12.60 min.  
C18 peak = 12.25 min.  
C19 peak = 12.93 min.

References:
1. Basic Relationships of Gas Chromatography, Advanstar, Cleveland, 1993  
5. Journal of Chromatography, 113 (1975) 69-95  

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