

Choosing the Correct Inlet Liner for you GC Analysis

Alan Broske
Lindy Miller
Jerome Szczepaniak

Agilent Technologies
2850 Centerville Rd.
Wilmington, DE 19808

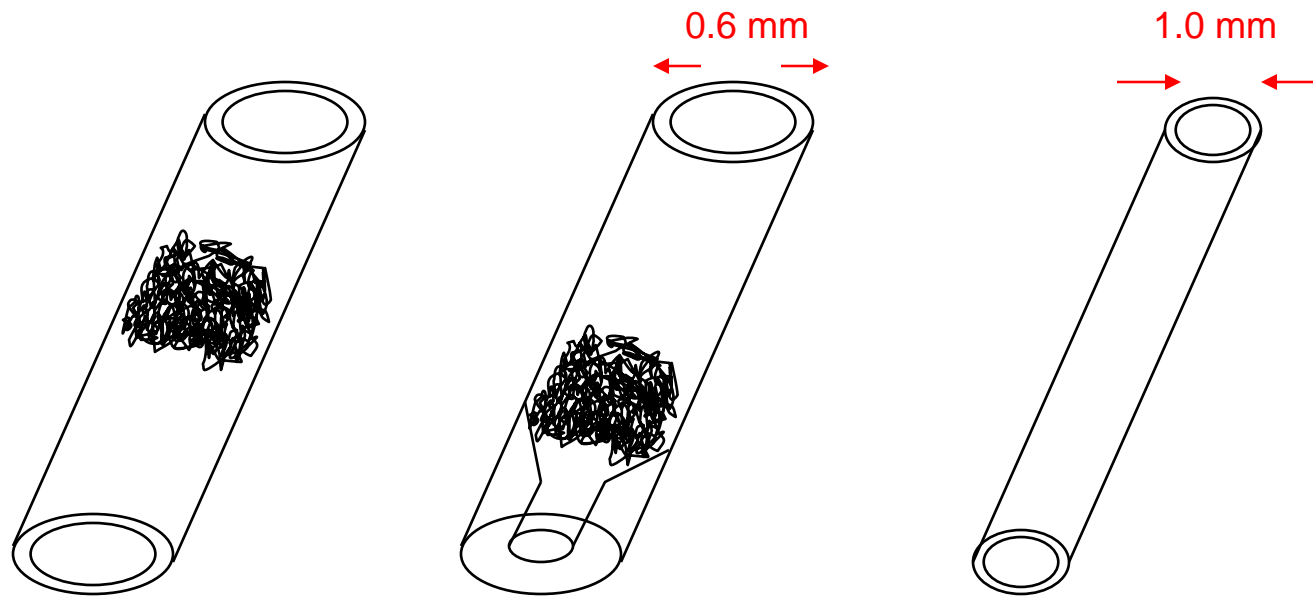
Introduction

Choosing the correct liner for a particular application must take several variables into account. Variables to consider include matching the liner to the injection type, matching the injection volume to the volume of the liner, determine if a vaporization aide is required and if any chemical treatments of the liner are needed.

Outline

- Dimensional characteristics of liners for different injection types
- Matching the injection volume (resulting vapor volume) to the liner volume
- Types of vaporization aids
- Benefits of deactivated liners for active compounds

Liner Dimensions



Split

Splitless

PTV

Liner Internal Volume

Liner Design

Volume (Range)

Straight Tube

990-100 ul

Tapered

900-800 ul

Cup

800 ul

Special Designs

<700 ul

PTV

100 ul

Different liner designs have different internal volume
May need to check with supplier for liner volume

Calculated Vapor Volume of Selected Solvents 1 ul at 250° C

Solvent	20 psi	5 psi
Iso-Octane	110 ul	194 ul
Hexane	139 ul	245 ul
Ethyl Acetate	186 ul	327 ul
Dichloromethane	284 ul	500 ul
Methanol	449 ul	792 ul
Water	1007 ul	1774 ul

Vapor Volume Considerations

- Vapor volume should be a maximum of 75% of liner volume
- Polar solvents have higher vapor volume
- Higher carrier gas pressure gives lower vapor volume
- Increasing injection volume does not result in corresponding increase in peak area
- Over time, excess vapor can condense in split trap

Vapor Volume Calculator

The screenshot shows the 'Solvent Vapor Volume Calculator' window. At the top, it displays 'Approximate vapor volume(ul): 1007 ul' and an 'Overload' indicator with three lights (two green, one red) and '112%'. Below this is a progress bar. The main interface is divided into several sections: 'Injection Volume (ul)' with a slider set to 1.0; 'Inlet Temp (C)' with a slider set to 250; 'Inlet Pressure' with a slider set to 20; 'Pressure Units' with radio buttons for KPa, psi (selected), and bar; 'Solvent Properties' with a dropdown menu set to 'Water', showing 'Boiling Pt (C): 100', 'Denisty (g/cm3): 0.998', and 'Mol Wt. (amu): 18.02'; and 'Injection Liner' with a dropdown menu set to '5062-3587 single-t' and 'Volume (ul): 900'. At the bottom, there are buttons for 'Print', 'Help', 'OK', and 'Edit Liner list', along with 'Capacity limits (%)' set to 75 and 100.

<http://www.chem.agilent.com/en-US/Support/Downloads/Utilities/Pages/GcPressureFlow.aspx>

Sample Vaporization Aides

- Glass Wool (Most Popular)
 - Deactivated, pesticide grade
- Cups
- Frits
- Tapers

Increase surface area-improved vaporization

Increase activity-decrease response for active compounds



Injection Volume Reproducibility (%RSD)

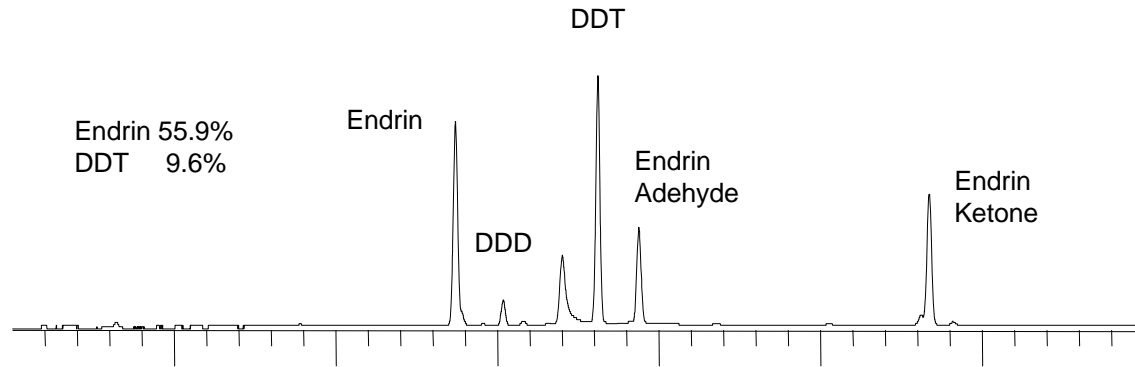
Split Ratio	200x	100x	50x
Standard Liner, No Glass Wool			
C10	3.7	3.3	3.3
C44	9.9	5.4	5.2
Standard Liner, Glass Wool			
C10	2.0	1.1	1.0
C44	2.4	0.9	1.0

Liner Deactivation

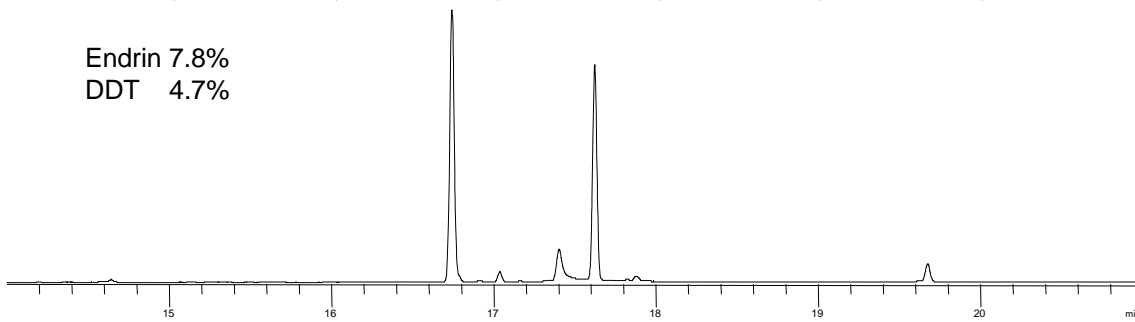
- Proprietary
- Hydrophobic
- Can have limited stability
- None present

Deactivated liner good for general use
Stability determined by sample type, cleanliness
Liner activity strongly influenced by glass wool

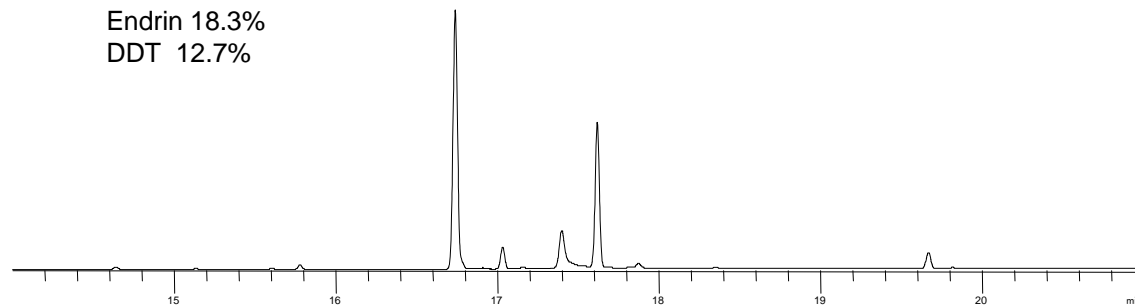
Liner Activity with/without Glass Wool



Standard Single taper liner w/o GW
No deactivation



Standard Single taper liner w/o GW
Deactivated



Standard Single taper liner with GW
Deactivated

Conclusions

- Choose the proper liner for the type of injection
- Match the injection size to the internal volume of the liner
 - Check injection volume with Volume Calculator
- Determine what if any vaporization aid is needed
 - Glass wool preferred for most split injections
- Use a deactivated liner (and glass wool) for most applications