

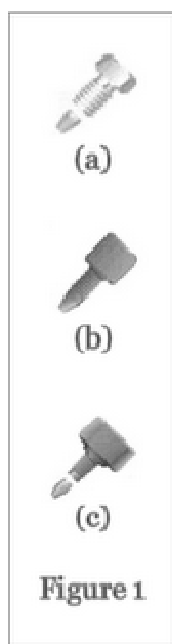
HPLC column fittings and seating depths

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PEAK SOLUTIONS

A resource for chromatographers

There are a number of available options when it comes to connecting a HPLC column to the tubing which contains the mobile phase. The options relate to the different types of fittings on the tubing that screw into the end of the HPLC column to form a leak-free seal. These are called compression fittings. Typical fittings are shown in Figure 1.



Type (a) is comprised of two parts: the 'male' nut which is threaded and matches up with the threading on the 'female' end fitting of the column; and the ferrule which is compressed onto the tubing as the nut is tightened. The nut may be tightened with a wrench or is also available as a finger-tight fitting (i.e. tightened by hand without the use of a wrench). The first time that the ferrule is used on the tubing will determine the position of the ferrule in the future. Removal of the fitting requires cutting the tubing. This type of compression fitting is suitable for high pressure applications (>6000psi).

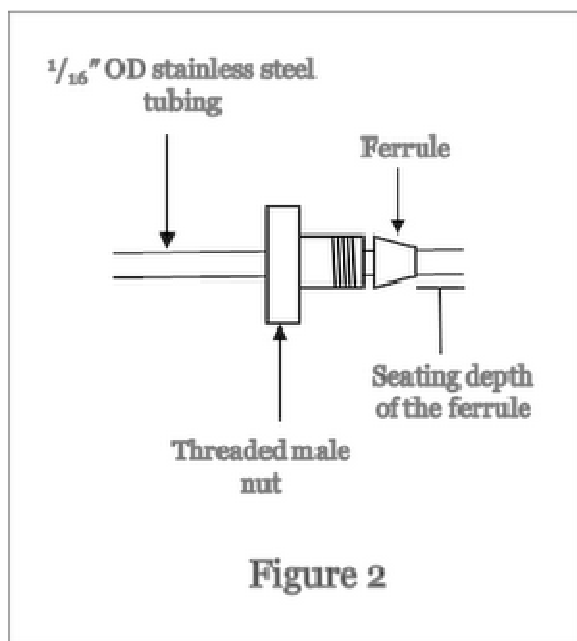
Type (b) is a one-piece polymeric fitting. This type of fitting is cheaper but does not last as long as the other types. It is suitable for pressures up to approximately 3000psi.

Type (c) is a two-piece polymeric fitting. This type lasts longer than the one-piece fitting because the ferrule is separate and thus is not rotated each time the fitting is screwed into the column. When the ferrule needs replaced it is not necessary to replace the nut. Pressures of up to approximately 4000psi may be used with this type of fitting.

Similar to type (a) fittings, type (b) and type (c) are also available in wrench tightened or finger-tight options.

Problem

When type (a) fittings are used the ferrule is irreversibly attached to the tubing and the seating depth, as shown in Figure 2, is permanently set. (The seating depth may also be referred to as the stop depth, pilot depth or ferrule lock distance.) This seating depth will depend on how far the tubing extends into the column end fitting. The majority of HPLC columns have the 'industry standard' seating depth of 0.1", but columns by Waters have a seating depth of 0.125". There is thus a potential for problems if changing over from one column to another. The fittings may leak or decrease the quality of the separation by contributing to band broadening. Polymeric fittings do not irreversibly attach to the tubing and thus the seating depth will adjust to the column in use.

**Solution**

If you are using columns which have different seating depths (i.e. Waters columns and columns from other manufacturers) on the same HPLC system then you need to either use a fitting which adjusts the seating depth each time the column is fitted (e.g. polymeric fittings), or you will need to change the fittings as required to suit the column being used. In this situation knowledge is the key requirement; provided that you know about seating depth it is easy to ensure that it does not have an effect on your chromatography.

The choice of which type of fitting to use is usually based on compatibility with the pressure

of the system being used must but it may also be influenced by personal preference. Stainless steel fittings should not be used on PEEK tubing. When you place a column on a HPLC system make sure that the tubing is seated all the way down into the column end fitting, then tighten. Care must be taken not to over-tighten either stainless steel or polymeric fittings since this can damage the threading on the fitting and on the column end-fitting making it difficult to obtain a good connection the next time they are used.

The technology of HPLC instrumentation is developing constantly and this affects the specifications required for the fittings. An example of this is the progression of ultra high pressure liquid chromatography. The pressure involved when using sub 2 micron particles requires the use of fittings which both minimise dead volume and can operate at pressures in excess of 15,000psi. Thus the development of fittings for columns has to keep pace with the development of the HPLC column technology.

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