

Usability of a core shell column using high performance liquid chromatograph for a routine analysis

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Abstract

Superficially porous particle (core shell particle) has been available as an alternative to using sub-2 μm particle for HPLC or UHPLC. Core shell particles are composed of a 1.2 to 1.9 μm solid core encircled a 0.25 μm to 0.5 μm porous layer. Especially a 2.6 μm core shell particle shows a half back pressure and the almost same efficiency to compare with sub-2 μm particle because of a large particle and reducing mass transfer due to a thin porous silica layer. In this study, a 2.6 μm core shell silica with a non-porous core approximately 1.6 μm in diameter and a superficially porous layer of 0.5 μm was used as a based material. A core shell silica bonded with C18 and end-capped was evaluated for a routine analysis, which is done using conventional 5 μm particle column sized 150 or 250 x 4.6 mm i.d. A core shell C18 column sized 100 x 4.6 mm and a conventional C18 column sized 250 x 4.6 mm were compared for an analysis of analgesics using Hitachi LaChrom ELITE HPLC under an isocratic mode. Both columns showed the same efficiency and an analysis time by a core shell C18 columns decreased to one third to compare with a conventional C18 column without changing of conditions except for a column, a same instrument, a same flow rate, a same mobile phase. In case of gradient separation of catechins, the almost same result was obtained as well as under a isocratic mode.

Core shell vs Sub-2 μm fully porous

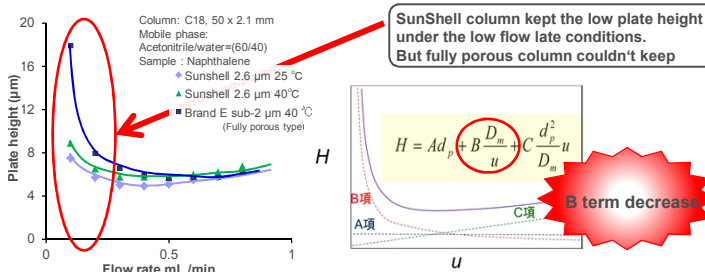


Figure. 1 Comparison of plate height

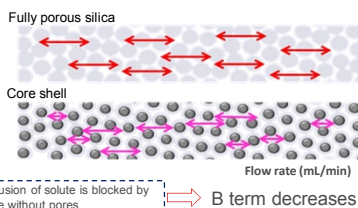


Figure. 2 Reason for decreasing B term

About SunShell

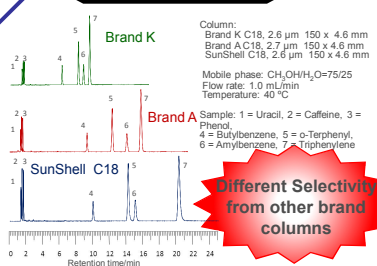


Figure 3. Comparison of standard samples

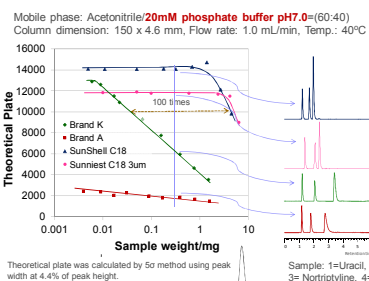


Figure 4. Stability under acidic pH condition

	Hydrogen bonding (Caffeine/Phenol)	Hydrophobicity (Amylbenzene/ Butylbenzene)	Steric selectivity (Triphenylene/ o-Terphenyl)
Brand K	0.48	1.54	1.20
Brand A	0.44	1.60	1.31
SunShell C18	0.40	1.59	1.47

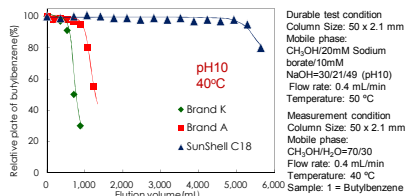


Figure 5. Stability under basic pH condition

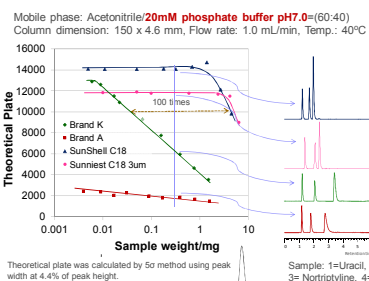


Figure 6. Loading capacity of amitriptyline

Applying for HPLC

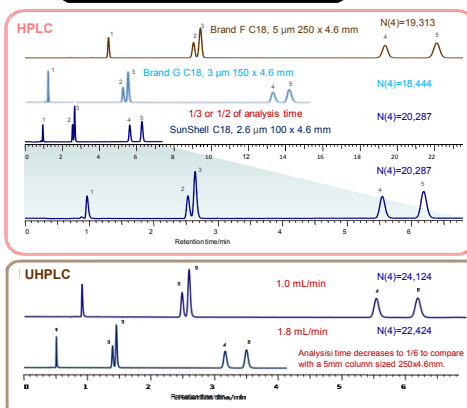


Figure. 7 Examples of transfer (isocratic separation)

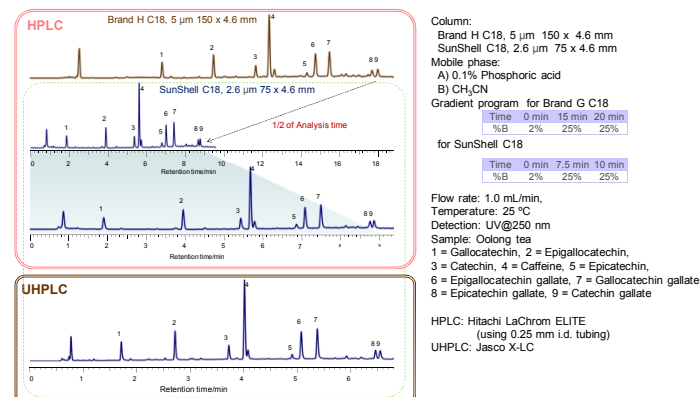


Figure. 8 Examples of transfer (gradient separation)

Applying for HPLC 2

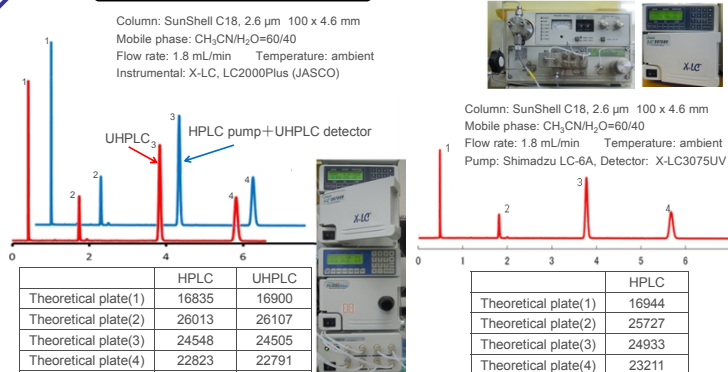


Figure. 9 Comparing between UHPLC and HPLC pump with Detector for UHPLC

Regarding a core shell column, there was no difference between a system combining HPLC pump and UHPLC detector and UHPLC system. It is unnecessary for a core shell column to use UHPLC pump. A point of note is that a core shell column should be used under smaller void volume conditions to get higher theoretical plate on HPLC.

Conclusions

The 100 X 4.6 sized SunShell column could achieve the same separation to compare with the 250 X 4.6 sized 5 μm fully porous column under isocratic performance.

An analysis time by a core shell C18 column decreased to one third or half comparing with a conventional C18 columns without changing of analytical conditions.

In gradient separation of catechins, the good result was obtained as well as under isocratic mode.

In case of a core shell column, HPLC with a detector for UHPLC is enough for 100% performance.

Comparing between SunShell and other brand columns ... SunShell has

- Different selectivity
- High stability under both acidic and basic pH conditions
- Good peak shape for amitriptyline
- High Loading capacity