

# Reduction of Solvent Consumption in HPLC (2020 #1) –Tips for Isocratic Mode

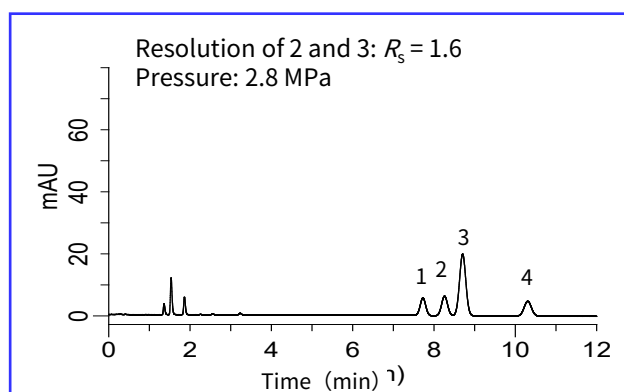
GL Sciences has been suggesting reduction of solvent consumption in HPLC for more than 15 years. This technical note focuses again on how to reduce solvent consumption in HPLC by changing the column I.D. A reduction of more than 25% can be easily achieved in isocratic mode. This technical note is suitable for those who are using 4.6 mm I.D. columns.

(K. Suzuki)

## For 4.6 mm I.D. column users

The example below shows reduction of solvent consumption from a 4.6 mm I.D. column. First, select the column I.D. depending on your reduction target; 4.0 mm I.D. and 3.0 mm I.D. enable ca. 25% and 60% reduction, respectively. Do not change the particle diameter, column length or packing material. When the narrower column is installed on the HPLC system, adjust the flow rate according to the ratio of the cross-sectional areas of the columns

(i.e., 1:0.75:0.4 for 4.6 mm I.D. : 4.0mm I.D. : 3.0mm I.D.).



### Conditions

**System** : GL7700  
**Column** : InertSustain C18 (5 $\mu$ m, 150 mm long)  
**Mobile Phase** : A) CH<sub>3</sub>CN  
 B) H<sub>2</sub>O  
 A/B = 75/25, v/v  
**Column Temp.** : 40 °C  
**Detection** : UV 254 nm  
**Inj. Vol.** : 1  $\mu$ L

Note: other values are shown in the figures.

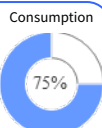
1. *n*-Butylbenzene
2. *o*-Terphenyl
3. Triphenylene
4. *n*-Amylbenzene

Column : InertSustain C18  
 5  $\mu$ m, 150 x 4.6 mm I.D.  
 Flow rate: 1.0 mL/min

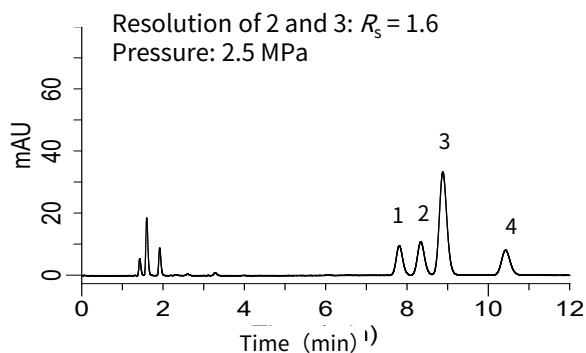


Only by changing the column I.D. and flow rate

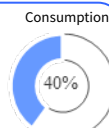
Column : InertSustain C18  
 5  $\mu$ m, 150 x 4.0 mm I.D.  
 Flow rate: 0.75 mL/min



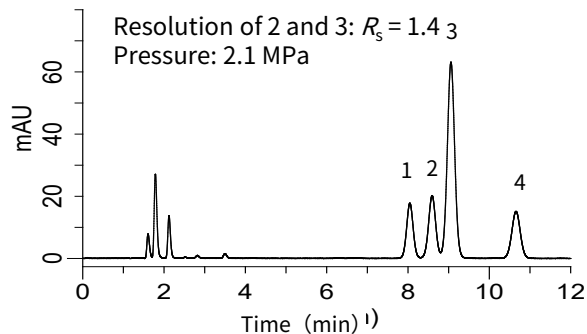
25 % Reduction!



Column : InertSustain C18  
 5  $\mu$ m, 150 x 3.0 mm I.D.  
 Flow rate: 0.4 mL/min

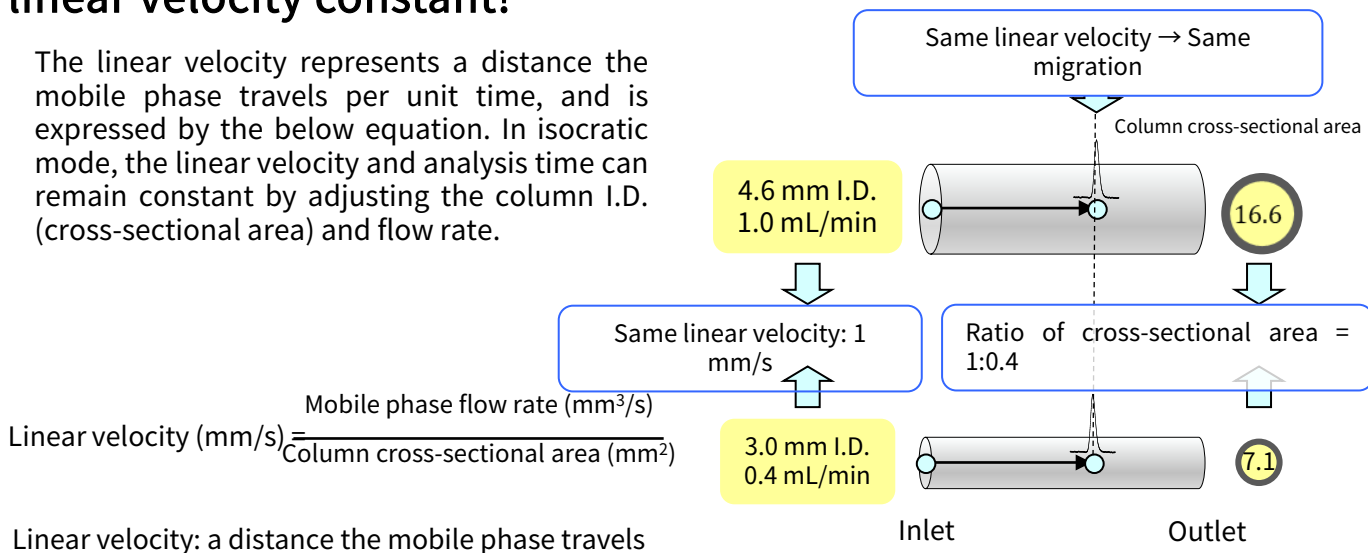


60 % Reduction!



# Similar chromatograms are obtained in the same analysis time when the **I.D. and flow rate** are adjusted to keep the **linear velocity constant!**

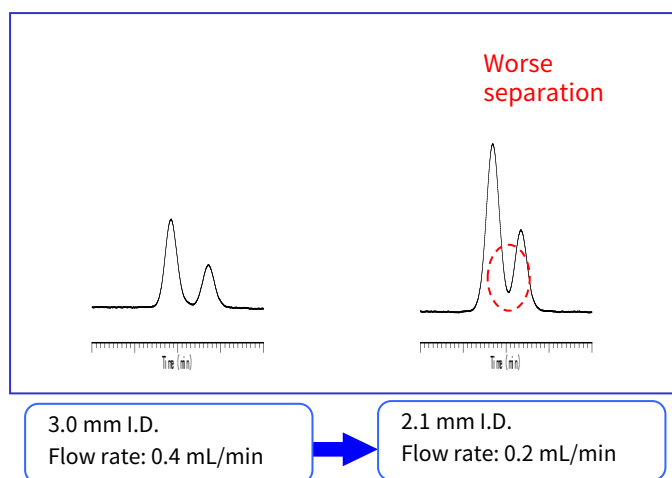
The linear velocity represents a distance the mobile phase travels per unit time, and is expressed by the below equation. In isocratic mode, the linear velocity and analysis time can remain constant by adjusting the column I.D. (cross-sectional area) and flow rate.



Linear velocity: a distance the mobile phase travels from inlet to outlet per unit time.

## I.D. below 2.1 mm is difficult to use on conventional HPLC systems.

The figure on the right shows an I.D. reduction from 3.0 mm to 2.1 mm. As can be seen in the figure, the separation got worse by reducing the column I.D. This is because of the larger contribution of extra-column dispersion to total dispersion with 2.1 mm I.D. Therefore, a system with a low dead volume such as semi-micro LC, micro LC or UHPLC is necessary.



GL Sciences disclaims any and all responsibility for any injury or damage which may be caused by this data directly or indirectly. We reserve the right to amend this information or data at any time and without any prior announcement.

### GL Sciences Inc. Japan

22-1 Nishishinjuku 6-chome  
Shinjuku-ku, Tokyo  
163-1130, Japan

Phone: +81-3-5323-6620  
Fax: +81-3-5323-6621  
Email: [world@glsc.co.jp](mailto:world@glsc.co.jp)  
Web: [www.glsciences.com](http://www.glsciences.com)

### GL Sciences Inc. USA

4733 Torrance Blvd. Suite 255  
Torrance, CA 90503  
USA

Phone: +1-310-265-4424  
Fax: +1-310-265-4425  
Email: [info@glsciencesinc.com](mailto:info@glsciencesinc.com)  
Web: [www.glsciencesinc.com](http://www.glsciencesinc.com)

### GL Sciences B.V.

Dillenburgstraat 7C  
5652AM, Eindhoven  
The Netherlands

Phone: +31-40-254-9531  
Email: [info@glsciences.eu](mailto:info@glsciences.eu)  
Web: [www.glsciences.eu](http://www.glsciences.eu)

### GL Sciences (Shanghai) Limited

Tower B, Room 2003  
Far East International Plaza  
No.317 Xianxia Road, Changning District  
Shanghai, China 200051

Phone: +86-21-62782272  
Email: [contact@glsciences.com.cn](mailto:contact@glsciences.com.cn)  
Web: [www.glsciences.com.cn](http://www.glsciences.com.cn)



International Distributors

Visit our Website at [www.glsciences.com/distributors](http://www.glsciences.com/distributors)