

1. Introduction

Advantages of ultra-fast LC are known as shorter analysis time, higher resolution and higher productivity. But in almost analyses, it is necessary to use specific LC instrument due to high back pressure produced by sub-2 μm particles. And another demerit, commercially available sub-2 μm columns show different selectivity compared to conventional column.

We developed new 2 μm column called YMC-UltraHT Pro C18 which designed for highly compromised advantages and disadvantages of ultra-fast LC columns.

YMC-UltraHT Pro C18 is same selectivity as YMC-Pack Pro C18, thus it is easy to scale down to 2 μm column from conventional particle size. Another advantage of our 2 μm column is lower pressure than competitor's 2 μm and sub-2 μm column. In this poster, we will show advantages of YMC-UltraHT Pro C18 and usage under ultra-fast LC conditions.

2. Features of Ultra-fast LC

Advantages

- High speed
- Superior resolution
- High throughput

Disadvantages

- High back-pressure
- Necessary to use specific LC system
- Difficulty in method transfer

Column must be designed to maximize advantages and minimize disadvantages

3. YMC designs

YMC-UltraHT Pro C18 for Ultra High Throughput

High resolution

- Functionalized ultra-pure 2.0 μm silica gel with 12 nm pore size.
- Designed for lower pressure but better performance than sub-2 μm particles.
- Instruments are not only specific ultra-fast LC but ordinary LC available.

Same selectivity as conventional ODS

- Same separation as conventional 3 μm or 5 μm Pro C18 column.
- Applicable for various compounds such as pharmaceuticals, foods and natural products.
- Simple method transfer applicable without changing eluent conditions.

Particles	Spherical, ultra-pure silica 2 μm particle size, 12 nm pore size
Bonded phase	Monomeric C18 Completely end-capped
Column size	2 mm i.d. x 30, 50, 75, 100 mm 3 mm i.d. x 50, 75, 100 mm
Available pH range	pH 2 - 8
Maximum pressure	50 MPa



4. Advantages of YMC-UltraHT Pro C18

High column efficiency and low column pressure

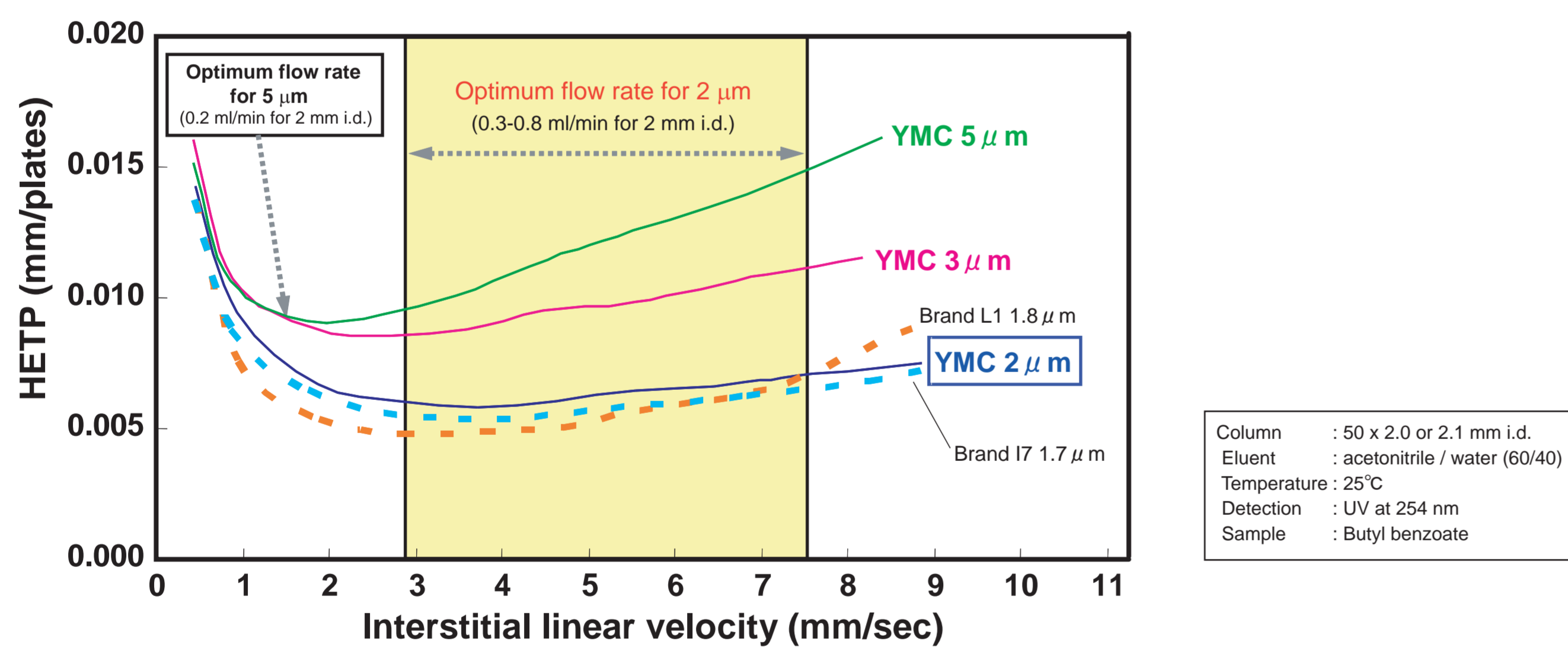


Fig.1 Linear velocity versus column efficiency (Van Deemter curves)

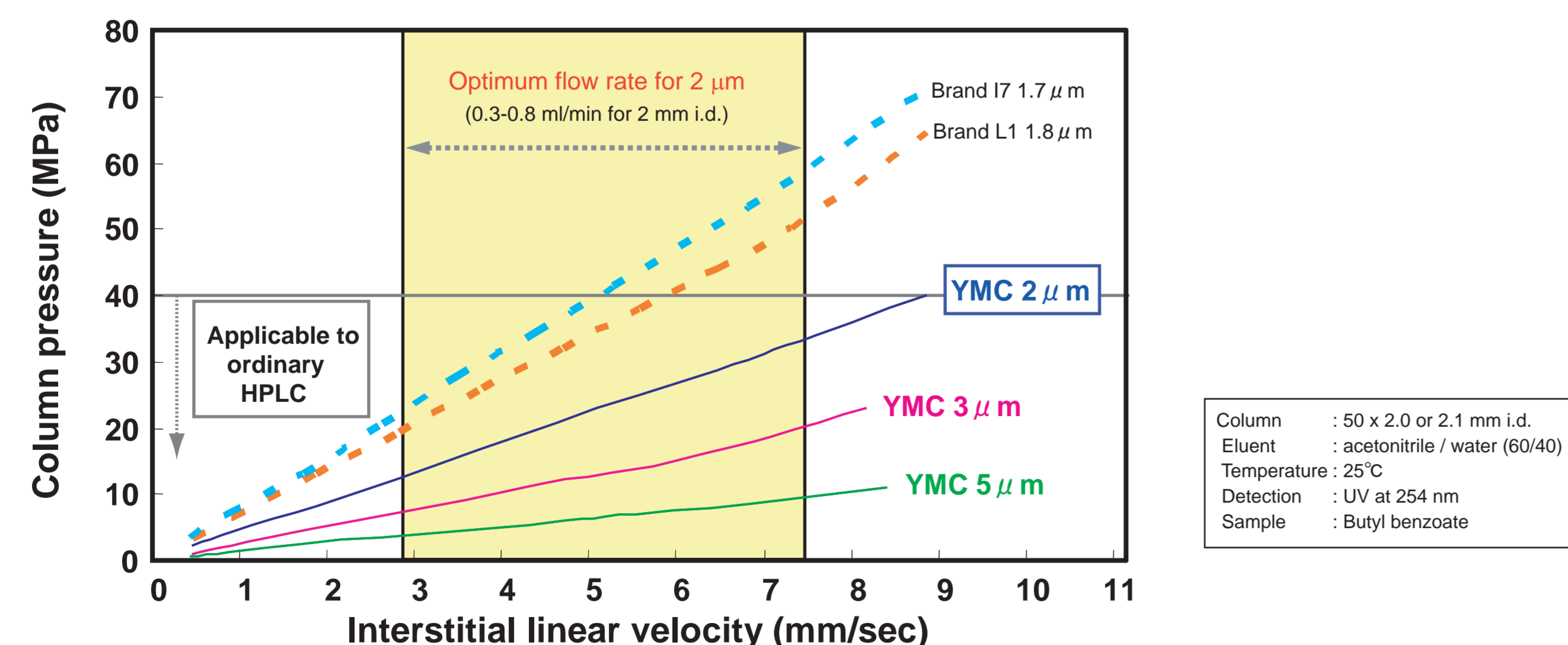


Fig.2 Linear velocity versus column pressure

Fig.1 and Fig.2 show linear velocity versus HETP and column pressure, respectively. Fig.1 is called van Deemter curves (H-u curves).

YMC 2 μm column shows almost same efficiency to competitors' sub-2 μm in 0.3 - 0.8 ml/min for 2 mm i.d. of flow rate (Fig.1). On the other hand, YMC 2 μm shows apparently lower column pressure than competitors' (Fig.2). Thus, it concludes YMC 2 μm column shows same efficiency in 40% lower column pressure than competitors'.

The effect of column pressure

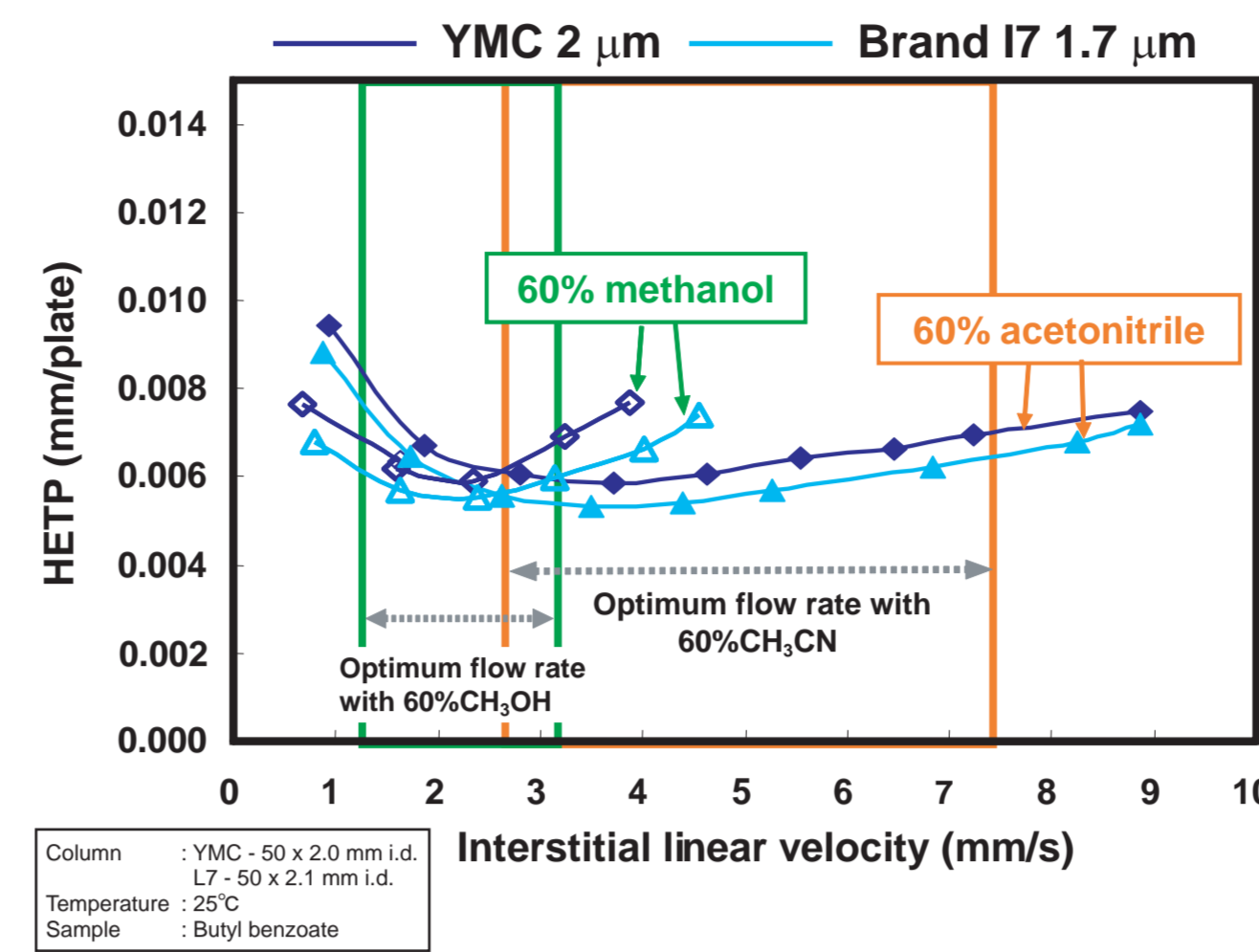


Fig.3 H-u curves by 60% acetonitrile and 60% methanol

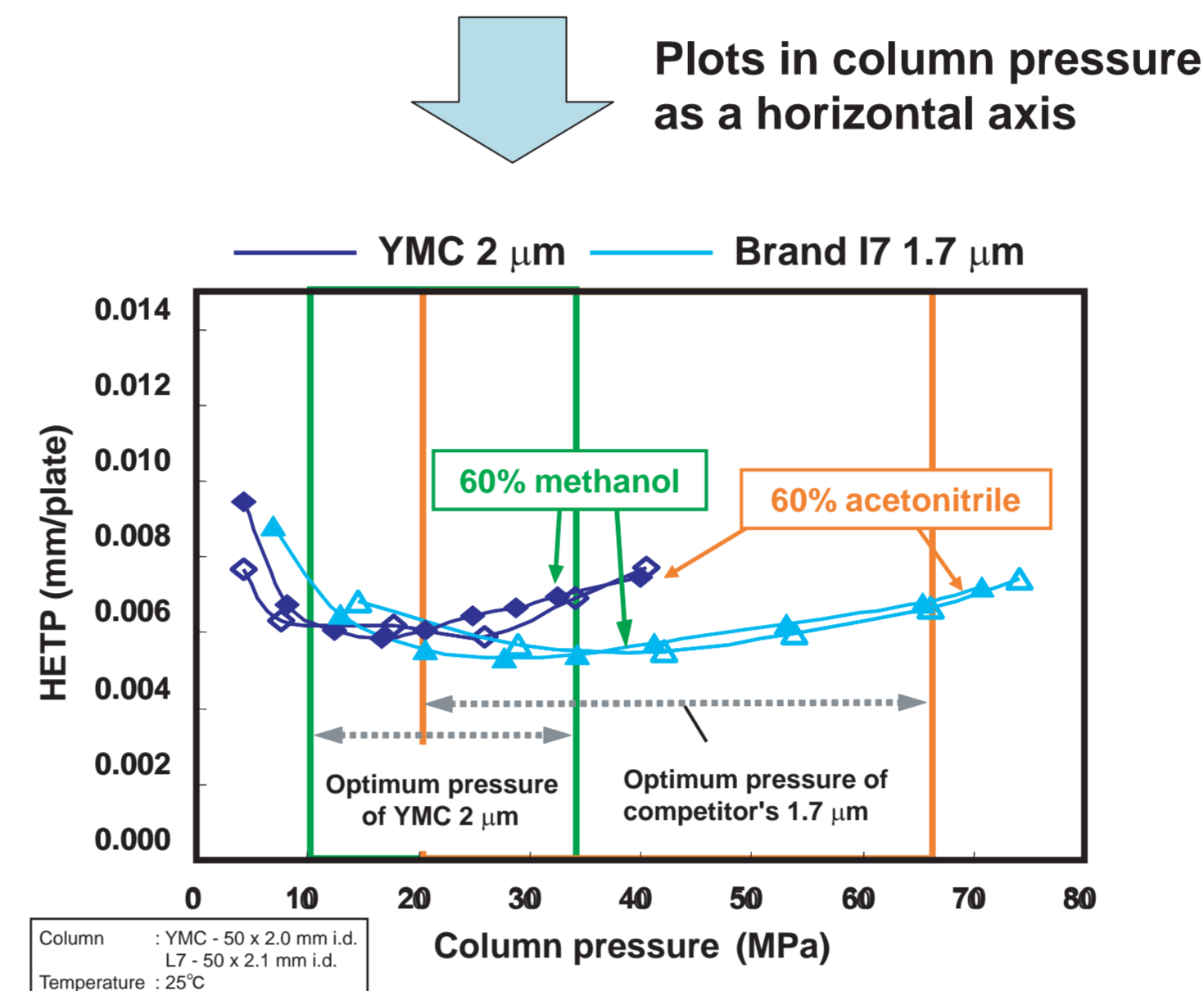


Fig.4 Column pressure versus HETP in different eluent

- Not always higher flow rate causes higher column efficiency
- To obtain maximum resolution, it should be chosen optimum column pressure of the particle.
- Compared to competitor's sub-2 μm , YMC-2 μm shows 95% efficiency but 50% lower column pressure at same flow rate.

Same selectivity as different particle size of Pro C18 column

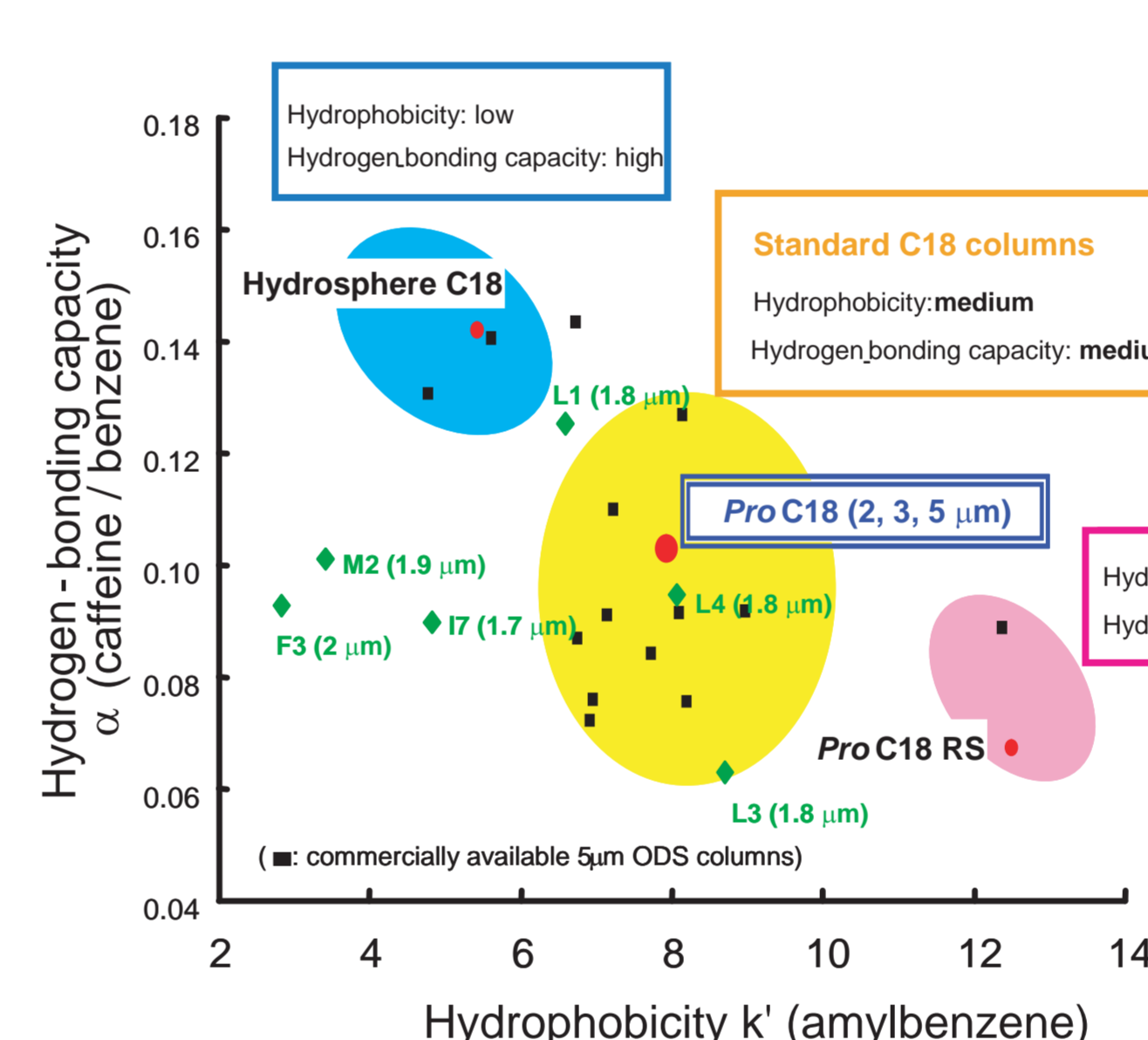


Fig.5 Comparison of selectivity balance between k' and α

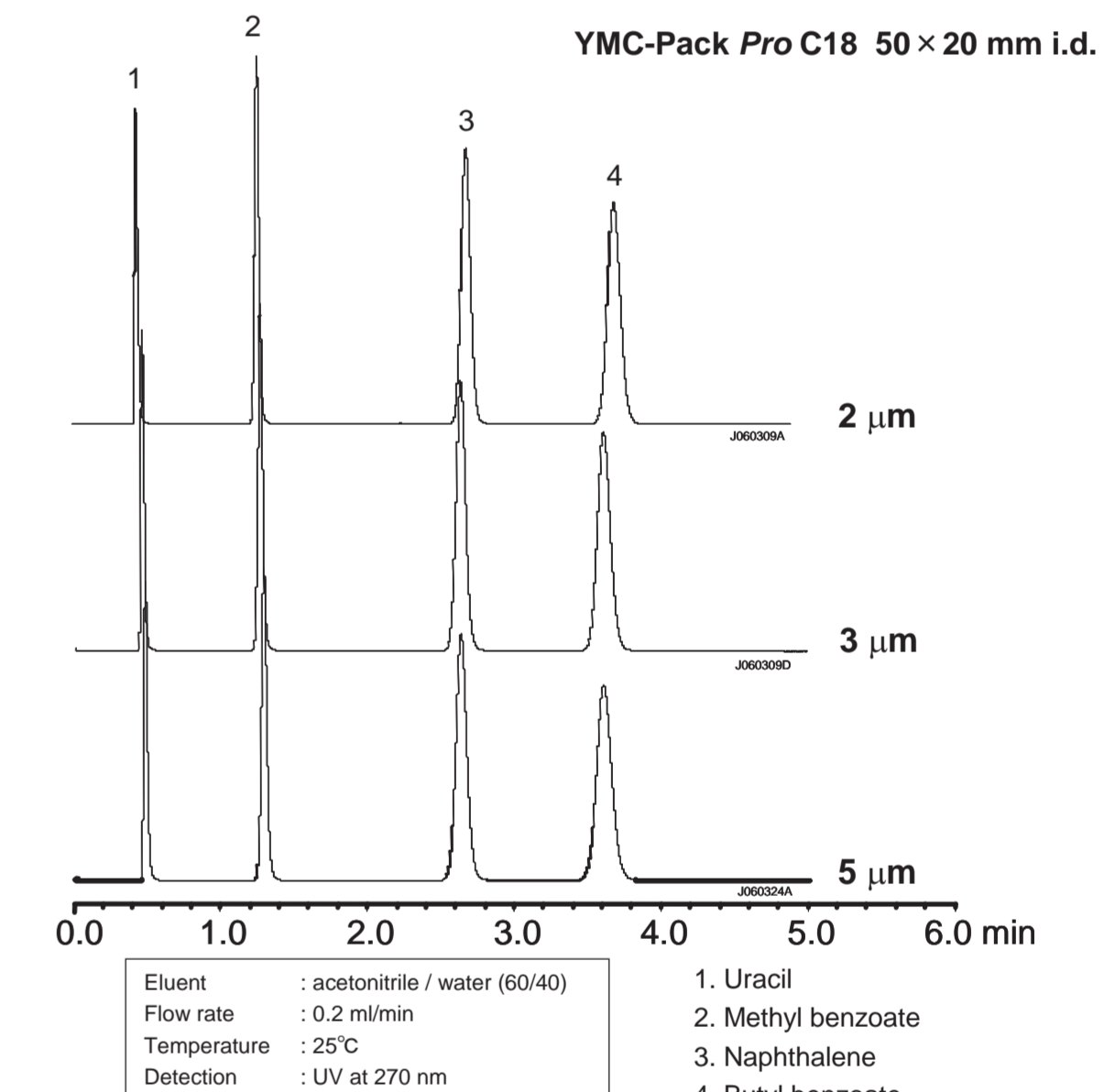


Fig.6 Chromatograms of different particle size

2 μm UltraHT Pro C18 shows not only ordinary selectivity as ODS column but also same selectivity as 3 μm and 5 μm Pro C18 (Fig.5). Chromatograms of different particle size are shown in Figs.6. YMC 2 μm gives excellent reproducibility compared with 3 μm and 5 μm .

Easy method transfer from conventional LC to Ultra-fast LC

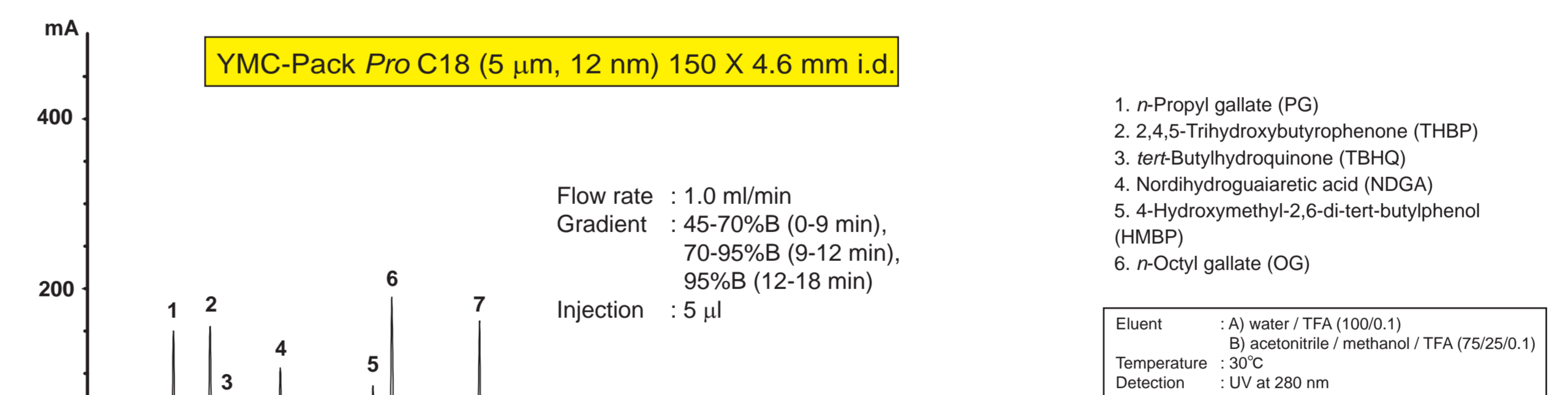


Fig.7 Method transfer from conventional column to YMC 2 μm

The chromatograms of antioxidant separation are shown in Figs.7.

Method transfer from 5 μm conventional column (150 x 4.6 mm i.d.) to YMC 2 μm column (50 x 2.0 mm i.d.) was attempted.

It takes 17 min with conventional column, but YMC-UltraHT Pro C18 makes shorten analysis time in 92% without changing eluent and separation pattern.

4. Conclusions

- Ultra-fast LC column makes it possible to shorter analysis time.
- 2 μm YMC-UltraHT Pro C18 column shows same selectivity as 3 μm and 5 μm Pro C18.
- Due to low column pressure, the ordinary LC system (semi-micro system) is applicable for ultra-fast analyses at high flow rate.