

Using the Prep-24 Dual Piston Pump System for Analysis of Parabens with the Hitachi LaChrom Elite® Liquid Chromatography System

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Chromatography requires eluents to be pumped through the system at a constant pressure and flow rate in order to achieve optimal chromatographic results. The Prep-24 Dual Piston Pump system is a preparative pump system which can be used to pump eluent at 0.01-24.00 mL/min, a large range with small increments. Preparative scale pump systems are generally used with a high flow rate to do preparative work with components. The Prep-24, manufactured by Scientific Systems Inc. (SSI), can be used at pressures up to 6000 psi¹ and utilizes a computer driver for EZChrom Elite™. In this application note we demonstrate that, in addition to its preparative scale mode, the Prep-24 also has utility as an analytical scale HPLC pump.

The Hitachi LaChrom Elite liquid chromatography system was used for analysis, replacing the traditional mobile phase L-2100 pumping module with the Prep-24 pump. The autosampler (L-2200), column oven (L-2300), and UV-vis detector (L-2420) were used, as in the traditional LaChrom Elite LC setup. Methylparaben (MP), ethylparaben (EP), propylparaben (PP), and butylparaben (BP), at 50 µg/mL concentrations of each analyte, were used for the analysis. Chromatographic conditions are shown in the following table:

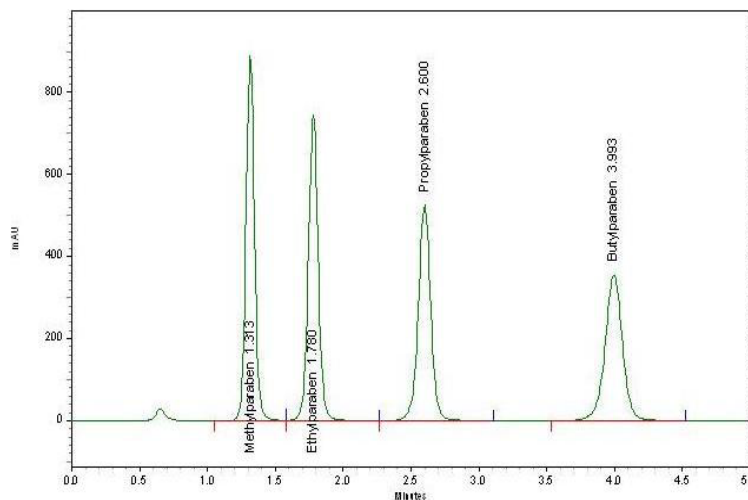
Chromatographic Conditions:

| Modules | Conditions |
|----------------------|--|
| Pumps (Prep-24) | 2.00 mL/min of mobile phase, 60% acetonitrile/40% water, isocratic |
| Autosampler (L-2200) | Injection volumes: 2.5, 5, 10, and 20µL of sample for linearity |
| Column Oven (L-2300) | Hitachi LaChrom Ultra C-18 3µm 4.6X100mm PN 891-5030, at 30°C |
| Detector (L-2420) | UV-vis detector set at 254 nm |
| Samples | 4 Parabens mixture at 50µg/mL concentration of each analyte |

Results:

| Component | %RSD at 2.5µL | %RSD at 5µL | %RSD at 10µL | %RSD at 20µL |
|-----------|---------------|-------------|--------------|--------------|
| MP | 0.48 | 0.30 | 0.30 | 0.23 |
| EP | 0.49 | 0.28 | 0.30 | 0.24 |
| PP | 0.52 | 0.31 | 0.31 | 0.23 |
| BP | 0.53 | 0.31 | 0.30 | 0.25 |

Chromatography for 5µL Injection Volume:



| Component | Avg N | Avg Rs | Avg T | R ² -value |
|-----------|-------|--------|-------|-----------------------|
| MP | 2129 | - | 1.1 | 0.9991 |
| EP | 2992 | 3.8 | 1.0 | 0.9999 |
| PP | 4048 | 5.6 | 1.0 | 0.9999 |
| BP | 4730 | 7.0 | 1.0 | 0.9999 |

Discussion:

The Hitachi LaChrom Elite Liquid Chromatography System, equipped with the SSI Prep-24 pump used in analytical mode, gives reproducible and linear data with excellent system suitability. The reproducibility for each component at each injection volume level (2.5, 5, 10, and 20µL) showed a %RSD < 0.6%. The linearity of each component over these injection volume levels showed an R²-value of > 0.999. The column efficiency (N) was > 2000 theoretical plates, the resolution (Rs) between each component was > 2.0, and the tailing factor for each component was < 1.5. Therefore, the LaChrom Elite® Chromatography System, using the Prep-24 pump in analytical mode, is suitable, reproducible, and linear.

References:

1- Prep-24 Pump Operator's Manual. Scientific Systems, Inc, 90-2497 rev D, 2007.

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