

APPLICATION OF COUNTERCURRENT CHROMATOGRAPHY (CCC) IN WINE RESEARCH AND WINE ANALYSIS

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One of the few liquid chromatographic techniques that can be predictably scaled up from analytical to process scale is countercurrent chromatography (CCC)^{1,2}. In combination with the 100 % recovery of the sample and the gentle separation conditions, this technique is ideally suited to the analysis of polar wine constituents. In the first part of the lecture, CCC instrumentation and its application to the analysis of, e.g., labile aroma precursors³, antioxidants^{4,5} and anthocyanins^{6,7} will be presented. In the second part, novel CPC instrumentation⁸ for the fractionation of polymeric wine constituents as well as the scale-up of the technique^{9,10} for separations in the 10-100 g range will be described.

References

1. Y. Ito, W.D. Conway, *High-Speed Countercurrent Chromatography*, Wiley Interscience: New York, 1996.
2. W.D. Conway, R.J. Petroski, *Modern Countercurrent Chromatography*, ACS Symp. Ser. 593, American Chemical Society: Washington, 1999.
3. P. Winterhalter, B. Baderschneider, B. Bonnländer, Analysis, structure and reactivity of labile terpenoid aroma precursors in Riesling wine. In: A.L. Waterhouse, S.E. Ebeler (Hrsg.): CHEMISTRY OF WINE FLAVOR. ACS Symp. Ser. 714, American Chemical Society: Washington, 1999, S. 1-12.
4. B. Baderschneider, P. Winterhalter, Isolation and characterization of novel stilbene derivatives from Riesling wine. *J. Agric. Food Chem.* **48**, 2681-2686 (2000).
5. B. Baderschneider, P. Winterhalter, Isolation and characterization of novel benzoates, cinnamates, flavonoids, and lignans from Riesling wine and screening for antioxidant activity. *J. Agric. Food Chem.* **49**, 2788-2798 (2001).
6. A. Degenhardt, S. Hofmann, H. Knapp, P. Winterhalter, Preparative separation of anthocyanins by high-speed countercurrent chromatography and application of the color activity concept to red wine. *J. Agric. Food Chem.* **48**, 5812-5818 (2000)
7. M. Schwarz, S. Hillebrand, S. Habben, A. Degenhardt, P. Winterhalter, Application of high-speed countercurrent chromatography to the large-scale isolation of anthocyanins. *Biochem. Eng. J.* **14**, 179-189 (2003).
8. A. Degenhardt, U.H. Engelhardt, P. Winterhalter, Y. Ito, Centrifugal precipitation chromatography: a novel chromatographic system for fractionation of polymeric pigments from black tea and red wine by. *J. Agric. Food Chem.* **49**, 1730-1736 (2001)
9. Q. Du, P. Winterhalter, Y. Ito, Large convoluted tubing for scale-up of slow rotary countercurrent chromatograph. *J. Liq. Chromatogr. & Rel. Technol.* **26**, 1991-2002 (2003).
10. N. Köhler, E. Chou, Y. Ito, P. Winterhalter, Development of a new preparative spiral-coil low speed rotary countercurrent chromatographic (Spiral-coil LSRCCC) method. *J. Liq. Chromatogr. & Rel. Technol.* **27**, 2547-2560 (2004).