

Miniaturized Asymmetrical Flow Field-Flow Fractionation for the Fast Separation of Nanoparticle Mixtures

Dr. Florian Meier^(a), Dr. David Müller^(b), Zhengchao You^(c), Dr. Steffen Weidner^(c), Dr. Thorsten Klein^(a)

^(a)Postnova Analytics GmbH, ^(b)Centre Suisse d'Electronique et de Microtechnique (CSEM), ^(c)Bundesanstalt für Materialforschung und -prüfung (BAM)

General Information

ID0049

Application Nano
Technology mAF4-UV
Info Postnova AF2000 MT Equipped With a Miniaturized Fractionation Cartridge, PN3211 UV-Vis
Keywords Miniaturized AF4, Fast Analysis Times, Nanoparticle Analysis

Introduction

Asymmetrical Flow Field-Flow Fractionation (AF4) is a powerful tool for the separation of particles in the size range of approximately 1 - 3000 nm. However, particularly for polydisperse samples, analysis times may easily reach one hour or longer, hampering its application to high-throughput analyses. One possibility to significantly reduce analysis times in AF4 is the application of a miniaturized fractionation cartridge [1,2].

Miniaturized Asymmetrical Flow Field-Flow Fractionation

In miniaturized AF4 (mAF4), both external dimensions as well as the separation area are significantly reduced in comparison to a conventional analytical fractionation cartridge (Figure 1).

The benefits of mAF4 include:

- Significantly reduced sample consumption and sample dilution giving improved limits of detection
- Improved compatibility with mass spectrometric detection systems due to lower flow rates
- Significantly reduced analysis time

The reduced analysis time is a major advantage of mAF4 as demonstrated in figure 2 where the elution times for a mixture of three gold nanoparticle size standards (10 nm, 30 nm and 60 nm) could be dramatically reduced in comparison to conventional AF4.

Conclusion

Miniaturized Asymmetrical Flow Field-Flow Fractionation is a powerful complement to AF4 performed with a conventional analytical cartridge. Its low operational costs along with its fast analysis times and low sample consumption renders mAF4 a valuable tool for fast screening analyses and studies, when fully optimized peak resolution is not required.

References

- [1] Müller D., Cattaneo S., Meier F., Welz R., deMello A.J., *Frontiers in Chemistry*, 2015, 3.
- [2] You Z., Meier F., Weidner S., *Separations*, 2017, 4(1), 8-19.



	mAF4	AF4
Dimensions [cm]	8 x 4	33.5 x 6
Separation area [cm ²]	4.3	32.8

Figure 1: Comparison of mAF4 and AF4 (with permission from [1]).

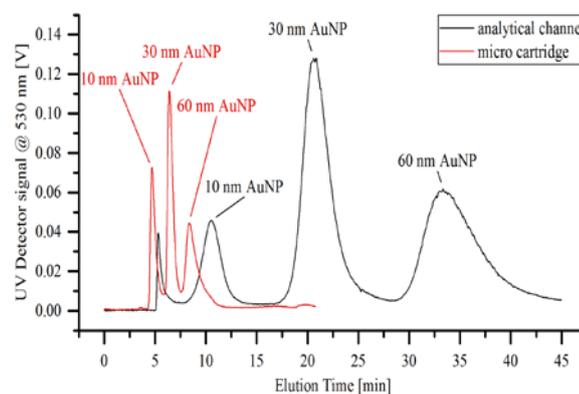


Figure 2: Comparison of fractograms obtained from AF4 (black) and mAF4 (red) for a mixture of gold nanoparticles of 10, 30 and 60 nm (with permission from [1]).