

TECHNOTE 103

Purification of Nanoparticles by Dialysis

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Introduction

Micromod's nanoparticles are most frequently supplied in aqueous suspension without any surfactants. Our protein-coated particles come in PBS buffer and sodium azide as antimicrobial agent.

All our magnetic, fluorescent and white nanoparticles with diameters < 200 nm, that do not show any significant sedimentation during typical dialysis times, can easily be purified from molecules or salts by dialysis. For dialysis of magnetic particles magnetic stirring should be prevented. The driving force for dialysis is the different concentration of the solute insight and oversight of the membrane. A maximum dialysis efficiency is achieved, if the concentration differential of the solute is large. The dialysis is a gentle purification method to remove the excess of reagents after activation or functionalization of chemical groups on the particle surface or for buffer exchange. New dialysis membranes with high Molecular Weight Cut Off (MWCO) allow the particle purification from excess of proteins, antibodies or other larger molecules. This is an important advantage to size exclusion chromatography, that is limited to removal of compounds with molecular weights < 1000 Da. Dialysis is also an adjuvant alternative to ultracentrifugation, that prevents sonication to resuspend the pellet, especially if sensitive biomolecules are present in the system.

Handling Instructions

All our nanoparticles with diameters < 200 nm can be purified from disturbing molecules or salts by dialysis. The performance of the dialysis membrane is defined by the molecular weight at which 90% of the solute will be retained by the membrane.

For the choice of the dialysis membrane the following correlation of MWCO and pore size of the membrane and of the particle diameter may be helpful:

MWCO (Daltons)	Pore Diameter / Particle Diameter		
	µm	nm	Å
1000000	0.1	100	1000
500000	0.02	20	200
100000	0.01	10	100
50000	0.004	4	40
10000	0.0025	2.5	25
5000	0.0015	1.5	15

The following table provides a selection of commercially available dialysis membranes with MWCO ≥ 50,000 Da and ready-to-use dialysis units for typical particle dialysis applications. This selection summarizes suitable dialysis membranes from Spectrum Laboratories, Inc. Other dialysis membranes with similar properties can be used as well.

Dialysis tool	MWCO (Daltons)	Volume [ml]
Spectra/Por® Float-A-Lyzer® G2	50,000 100,000 300,000 1.000,000	Each 1 ml, 5 ml or 10 ml
Spectra/Por® Micro Float-A-Lyzer®	50,000 100,000	Each 100-200 µl or 400-500 µl
Spectra/Por® Tube-A-Lyzer® for dynamic dialysis	50,000 100,000	Each 8-10 ml or 25-30 ml
Spectra/Por® Biotech Cellulose Ester dialysis membrane	50,000 100,000 300,000	Variable volumes (10 m roll, e.g. 0.79 ml/cm)