

Materials List for:

Synthesis of Cationized Magnetoferritin for Ultra-fast Magnetization of Cells

Sara Correia Carreira¹, James P.K. Armstrong², Mitsuhiro Okuda^{3,4}, Annela M. Seddon¹, Adam W. Perriman⁵, Walther Schwarzacher⁶

¹Bristol Centre for Functional Nanomaterials, University of Bristol

²Department of Materials, Imperial College London

³Self Assembly Group, CIC nanoGUNE

⁴Ikebasque, Basque Foundation for Science

⁵School of Cellular and Molecular Medicine, University of Bristol

⁶H.H. Wills Physics Laboratory, University of Bristol

Correspondence to: Sara Correia Carreira at S.Carreira@bristol.ac.uk

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Materials

Name	Company	Catalog Number	Comments
4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES)	Fisher Scientific	BPE310-1	powder; prepare a 1 M stock solution at pH 8.6 and dilute to 50 mM prior to use. Check the pH carefully prior to synthesis!
apoferritin from equine spleen	Sigma Aldrich	A3641	we used LOT# 081M7011V
cobalt sulfate heptahydrate	Sigma Aldrich	C6768	prepare fresh solutions from the salt prior to synthesis
ammonium iron sulphate hexahydrate	Sigma Aldrich	F1543	prepare fresh solutions from the salt prior to synthesis
hydrogen peroxide solution (30%)	Sigma Aldrich	216763	prepare fresh solutions from the salt prior to synthesis
sodium citrate	Sigma Aldrich	S1804	powder; a 1 M solution can be prepared and kept at room temperature for several months
Milllex GP filter unit, 0.22 micron	Merck Millipore	SLGP033RS	syringe filter
Trizma base	Sigma Aldrich	T1503	powder; prepare a 1 M stock solution at pH 8.0 and dilute to 50 mM prior to use
sodium chloride	Sigma Aldrich	31434	powder; add to buffers as required
Centriprep centrifugal filter units	Merck Millipore	4310	Ultracel YM-50 membrane, 12 ml volume; use for initial concentration until the magnetoferritin solution has been concentrated from about 150 ml to 20 ml
Amicon Ultra-4 centrifugal filter units	Merck Millipore	UFC801024	Ultracel-10 membrane, 4 ml volume; use to concentrate magnetoferritin solution from about 20 ml to 2 ml
ANX Sepharose 4 Fast Flow	GE Healthcare	17-1287-04	we packed this column ourselves
HiPrep 26/60 Sephacryl S-300 HR column	GE Healthcare	17-1196-01	this column was bought ready packed
ÅKTA purifier system	GE Healthcare	28406264	
sample pump P-960	GE Healthcare	18-6727-00	load sample at a flow rate of 10 ml/min
automated fraction collector Frac-950	GE Healthcare	18-6083-00	
Bradford assay reagent	Sigma Aldrich	B6916	solution ready to use

Ferritin, Type I: from horse spleen	Sigma Aldrich	F4503	prepare ferritin standards from this solution to determine magnetoferritin concentration
<i>N,N</i> -dimethyl-1,3-propanediamine (DMPA)	Sigma Aldrich	308110	CAUTION: when adjusting the pH of a DMPA solution, perform this step in a fume hood
<i>N</i> -(3-dimethylaminopropyl)- <i>N'</i> -ethylcarbodiimide hydrochloride (EDC)	Sigma Aldrich	E6383	keep in freezer but bring to room temperature before opening the bottle
2-(<i>N</i> -morpholino)ethanesulfonic acid (MES)	AppliChem	A0689,0500	powder; prepare a 200 M stock solution at pH 5
dialysis tubing cellulose membrane	Sigma Aldrich	D9652	soak 10 min in deionized water before use
Dulbecco's Modified Eagle's Medium (DMEM), 1,000 mg/L glucose	Sigma Aldrich	D5546	warm in 37 °C water bath before use
fetal bovine serum	Sigma Aldrich	F7524	add to stock DMEM bottle, 10% (v/v) final concentration
penicillin/streptomycin solution	Sigma Aldrich	P0781	add to stock DMEM bottle, 1% (v/v) final concentration
glutamax solution	Gibco	35050-087	add to stock DMEM bottle, 1% (v/v) final concentration
human fibroblast growth factor	PeproTech	100-18B	add to DMEM freshly into cell culture flask with each media change; final concentration 5 ng/ml
phosphate buffered saline	Sigma Aldrich	D8537	sterile solution, for cell culture
trypsin/EDTA solution	Sigma Aldrich	E5134	keep in freezer and defrost in 37 °C water bath before use
ethylenediaminetetraacetic acid (EDTA)	Sigma Aldrich	E5134	powder; make a 2 mM solution in PBS
bovine serum albumin	Sigma Aldrich	A7030	add 0.5% (w/v) into 2 mM EDTA solution in PBS; carefully stir with magnetic stirrer, avoid foaming; filter sterilize through a 0.22 micron syringe filter
MACS multi stand	Miltenyi Biotec	130-042-303	for attachment of MACS magnet
MACS MS columns	Miltenyi Biotec	130-042-201	disposable; intended for single use, but if sterility is not required, they can re-used: wash with deionized water and 100% ethanol, and placed in a drying oven; discard if you observe rusty patches
MiniMACS separator magnet	Miltenyi Biotec	130-042-102	can be bought as a starter kit, together with columns and stands
MACS column pre-separation filter	Miltenyi Biotec	130-041-407	30 mm filter
Nitric acid solution, 64-66%	Sigma Aldrich	7006	
Titrand 907, syringe pump	Metrohm	2.907.0020	
Equipment used to characterize magnetoferritin and cationized magnetoferritin			
SpectraMax M5	Molecular Devices		Used to measure absorbance in the Bradford assay
JEM 1200 EX	JEOL		Used for TEM imaging of magnetoferritin
InVia Raman spectrometer	Renishaw		Used for Raman spectroscopy
Torus DPSS laser	Laser Quantum		Used for Raman spectroscopy

Bruker UltrafleXtreme	Applied Biosystems		Used for MALDI-TOF analysis of apoferritin and cationized apoferritin
ZetaSizer Nano-ZS	Malvern Instruments		Used to measure hydrodynamic diameter and zeta potential of magnetoferritin and cationized magnetoferritin
Magnetic Property Measurement System	Quantum Design		Used to measure magnetic saturation moment and magnetic susceptibility
Magnetom Skyra	Siemens		Used to determine longitudinal and transverse relaxivity
Tecnai 12 BioTwin Spirit	FEI		Used for TEM imaging of hMSC labeled with cationized magnetoferritin
710 ICP-OES	Agilent		Used to determine iron content in cells