

Materials List for

# Manganese Oxide Nanoparticle Synthesis by Thermal Decomposition of Manganese(II) Acetylacetonate

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## Materials

| Name   | Company                        | Catalog Number | Comments  |
|--|--------------------------------|----------------|---|
| <b>Chemicals and Gases</b>                   |                                |                |   |
| Benzyl ether (DE)                            | Acros Organics                 | AC14840-0010   | Concentration: 99%, 1 L   |
| Drierite                                     | W. A. Hammond Drierite Co. LTD | 23001          | Drierite 8 mesh, 1 lb   |
| Ethanol                                      | Decon Laboratories             | 2701           | 200 proof, 4 x 3.7 L  |
| Hexane                                       | Macron Fine Chemicals          | 5189-08        | Concentration: ≥98.5%, 4 L  |
| Hydrochloric acid                            | VWR                            | BDH3030-2.5LPC | Concentration: 36.5 - 38.0 % ACS, 2.5 L   |
| Manganese (II) acetyl acetonate (Mn(II)ACAC) | Sigma Aldrich                  | 245763-100G    | 100 g   |
| Nitrogen gas tank                            | Airgas                         | NI R300        | Research 5.7 grade nitrogen, size 300 cylinder  |
| Nitrogen regulator                           | Airgas                         | Y11244D580-AG  | Single stage brass 0-100 psi analytical cylinder regulator CGA-580 with needle outlet |
| Oleylamine (OA)                              | Sigma Aldrich                  | O7805-500G     | Concentration: 70%, technical grade, 500 g  |
| Silicone oil                                 | Beantown Chemical              | 221590-100G    | 100 g   |
| <b>Equipment</b>                             |                                |                |   |
| Centrifuge                                   | Beckman-Coulter                | Avanti J-E     | JA-20 fixed-angle aluminum rotor, 8 x 50 mL, 48,400 x g                               |
| Hemisphere mantle                            | Ace Glass Inc.                 | 12035-17       | 115 V, 270 W, 500 mL, temperature up to 450 °C  |
| Hot plate stirrer                            | VWR                            | 97042-642      | 120 V, 1000 W, 8.3 A, ceramic top   |
| Temperature controller                       | Yokogawa Electric Corporation  | UP351          |   |
| Temperature probe                            | Omega                          | KMQXL-040G-12  | Immersion probe, temperature up to 1335 °C  |
| Vacuum oven                                  | Fisher Scientific              | 282A           | 120 V, 1800 W, temperature up to 280 °C   |
| Vortex mixer                                 | Fisher Scientific              | 02-215-365     | 120 V, 50/60 Hz, 150 W  |
| Water bath sonicator                         | Fisher Scientific              | FS30H          | Ultrasonic power 130 W, 3.7 L tank  |

| <b>Tools and Materials</b>       |                              |              |   |
|----------------------------------|------------------------------|--------------|---|
| Dumont tweezer                   | Electron Microscopy Sciences | 72703D       | Style 5/45, Dumoxel, 109 mm, for picking up TEM grids                                       |
| Dumont reverse tweezer           | Ted Pella                    | 5748         | Style N2a, 118 mm, NM-SS, self-closing, holding TEM grids in place for sample preparation   |
| Mortar and pestle                | Amazon                       | BS0007       | BIPEE agate mortar and pestle, 70 X 60 X 15 mm labware                                      |
| Nalgene™ Oak Ridge tubes         | ThermoFisher Scientific      | 3139-0050    | Polypropylene copolymer, 50,000 x g, 50 mL, pack of 10                                      |
| Scintillation vials              | Fisher Scientific            | 03-337-4     | 20 mL vials with white caps, case of 500  |
| TEM grids                        | Ted Pella                    | 01813-F      | Carbon Type-B, 300 mesh, copper, pack of 50   |
| <b>Glassware Setup</b>           |                              |              |   |
| 4-neck round bottom flask        | Chemglass Life Sciences      | CG-1534-01   | 24/40 joint, 500 mL, #7 chem thread for thermometers  |
| 6-port vacuum manifold           | Chemglass Life Sciences      | CG-4430-02   | 480 nm, 6 ports, 4 mm PTFE stopcocks  |
| Adapter                          | Chemglass Life Sciences      | CG-1014-01   | 24/40 inner joint, 90°  |
| Condenser                        | Chemglass Life Sciences      | CG-1216-03   | 24/40 joint, 365 mm, 250 mm jacket length   |
| Drierite 26800 drying column     | Cole-Parmer                  | EW-07193-00  | 200 L/hr, 90 psi  |
| Funnel                           | Chemglass Life Sciences      | CG-1720-L-02 | 24/40 joint, 100 powder funnel, 195 mm OAL  |
| Interlocked worm gear hose clamp | Grainger                     | 16P292       | 1/2" wide stainless steel clamp, 3/8" to 7/8" diameter, to secure condenser tubing, 10 pack |
| Keck clips                       | Kemtech America Inc          | CS002440     | 24/40 joint   |
| Metal claw clamp                 | Fisher Scientific            | 05-769-7Q    | 22cm, three-prong extension clamps  |
| Metal claw clamp holder          | Fisher Scientific            | 05-754Q      | Clamp regular holder  |
| Mineral oil bubbler              | Kemtech America Inc          | B257040      | 185 mm  |
| Rotovap trap                     | Chemglass Life Sciences      | CG-1319-02   | 24/40 joints, 100 mL, self washing rotary evaporator  |
| Rubber stopper                   | Chemglass Life Sciences      | CG-3022-98   | 24/40 joints, red rubber  |
| Tubing for air/water             | McMaster-Carr                | 6516T21      | Clear Tygon PVC for air/water, B-44-3, 1/4" ID, 1/16" wall, 25 ft                           |
| Tubing for air/water             | McMaster-Carr                | 6516T26      | Clear Tygon PVC for air/water, B-44-3, 3/8" ID, 1/16" wall, 25 ft                           |
| Tubing for chemicals             | McMaster-Carr                | 5155T34      | Clear Tygon PVC for chemicals, E-3603, 3/8" ID, 1/16" wall, 50 ft                           |
| <b>Analysis Programs</b>         |                              |              |   |
| XRD analysis program             | Malvern Panalytical          | N/A          | X'Pert HighScore Plus   |
| FTIR analysis program            | Varian, Inc.                 | N/A          | Varian Resolutions Pro  |