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# Appendix C – Equipment

Using an approach to leverage research and private funding, the department has been successful to supplement limited state support for new equipment. Major pieces of equipment used by the program in support of instruction acquired since the last review (acquired since 2010) are summarized in Table C-1. Highlights include the following.

* 3D X-ray MicroCT system (NSF MRI proposal)
* Potentiostat, autoclave, and thermogravimetric analyzer (grants for critical minerals extraction)
* Atomic force microscope upgrade (SD Board of Regents)
* Grinder polishers and mounting press (industry donations)

Major equipment for the department acquired before 2010 is shown in Table C-2. The entire list of available equipment is available on request.

In addition to this equipment, the department has access to and uses equipment located in the Arbegast Advanced Manufacturing Center. This includes the following equipment:

* Five-axis friction stir welder
* Materials testing systems 110 kip and 70 kip
* Direct deposit laser deposition system with inert atmosphere and programmable 3-D position 2 kW YAG laser fitted with dual powder feeders
* Ultrasonic welder
* Cold Spray units
* Water jet cutter (10-x14-ft tank)

The department also has equipment not listed on the inventory list in Table C-1 including:

* Vacuum 30 kW induction melter
* Ultra-purity Zone refiner (1 meter, induction heated, inert and hydrogen gas atmosphere
* Czochralski Crystal grower ( 4-x4-in. melt pool, 25 kW induction generator)

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| Table C-1 Capital assets acquired since 2010 |
| Asset Description | Acq Date | Cost | Room  | Location |
| Leco, PR-36 Electro-hydraulic mounting press | 08/06/2015 | 8,662 | 124 | MI |
| Thermo Scientific, Still, 2 gph 120/208v 3ph | 02/25/2015 | 6,358 | 126 | MI |
| Workstation, Na-Haworth Unigroup: 48"x 24” | 10/03/2014 | 14,682 | 123 | MI |
| Millermatic 252, MIG Welders (2) | 06/01/2014 | 5,000 |  | MF |
| Lincoln Electric Precision TIG 225 Welders (2) | 06/01/2014 | 5,000 |  | MF |
| TA Instruments, Thermogravimetric analyzer with Au, 953000.908-Q500 | 02/18/2014 | 42,670 | 127 | MI |
| Potentiostat/galvanostat/EIS analyzer, Parstat 4000 | 02/11/2014 | 46,647 | 131 | MI |
| Pressure reaction apparatus, 4531-t-625-m(hc),115v | 02/10/2014 | 29,698 | 131 | MI |
| Sieving riffler, 02001-1- | 01/27/2014 | 7,094 | 131 | MI |
| Bruker Multimode 8-Upgrade Atomic Force Microscope + accessories | 01/10/2013 | 174,970 | 127 | MI |
| Video spectral comparator, VSC-6000/HS and Foram Raman | 06/27/2012 | 178,083 | 228 | MI |
| Action Mining Services, M5 Micron Mill Wave Table | 05/22/2012 | 3,977 | 130 | MI |
| Xradia, 3D X-ray tomography, MicroXCT-400, high-resolution, 1007548 | 05/11/2012 | 612,000 | 128C | MI |
| Metaserv 250 twin grinder polisher, 4910057 | 07/28/2011 | 15,447 | 124  | MI |
| QPEC #7 Flotation Cell | 05/30/2011 | 5,000 | 130 | MI |
| Tube furnace | 07/01/2010 | 6,470 | 121 | MI |
| Hydrogen palladium purifier | 05/24/2010 | 5,503 | 121 | MI |
| Eriesz Magnetic separator | 04/21/2010 | 13,181 | 130A | MI |

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| Table C-2 Capital assets acquired before 2010 |
| Asset Description | Acq Date | Amount | Room  | Location |
| Carbon coater | 12/30/2009 | 25,673 | 234 | MMI |
| Rame-Hart Model 500 Advanced Goniometer/tensiometer | 08/13/2009 | 36,870 | 113 | MMI |
| Micro-force test system, MTS | 08/13/2009 | 129,902 | 123 | MMI |
| Air hammer | 12/08/2008 | 6,393 |   | MF |
| Tester, microhardness | 05/14/2008 | 11,731 | 125 | MMI |
| Image analysis system (microscope) | 05/14/2008 | 16,000 | 124B | MMI |
| Action Mining Services, M5 Micron Mill Wave Table | 05/22/2012 | 3,977 | 130 | MMI |
| Grinder-polisher | 04/28/2008 | 5,048 | 124 | MMI |
| Abrasive cut-off saw | 04/24/2008 | 5,978 | 125 | MMI |
| Viscosity meter | 12/18/2007 | 5,608 | 102 | MMI |
| Prepregger, hot melt unidirectional | 08/20/2007 | 470,000 | 112 | MTDL |
| Trailer, 8x20 tandem auto | 07/01/2007 | 7,030 |   | MMI |
| Ellipsometer, discrete wavelength | 05/07/2007 | 43,105 | 127 | MMI |
| Electrometer | 03/20/2007 | 5,456 | 111 | MMI |
| Plasma cleaner w/vacuum pump | 01/17/2007 | 8,288 | 113 | MMI |
| Three roll mill | 01/12/2007 | 11,245 | 111 | MMI |
| Wilhelmy Plate Surface tension meter  | 12/21/2006 | 30,968 | 113 | MMI |
| Dimatix materials printer | 07/14/2006 | 31,720 | 102 | MTDL |
| Ultra-microtome | 06/30/2006 | 34,193 | 211 | MEP |
| Spin coater | 06/27/2006 | 5,477 | 113 | MMI |
| Bath cryostat system | 06/14/2006 | 29,121 | 133 | MEP |
| Impact tester | 06/07/2005 | 34,000 | 125 | MMI |
| Nicomp 380 submicron particle size analyzer w/zeta potential | 02/01/2005 | 53,182 | 113 | MMI |
| Bohlin Rheometer | 06/15/2004 | 32,945 | 113 | MMI |
| Table C-2 Capital assets acquired before 2010 (Cont’d) |
| Asset Description | Acq Date | Amount | Room  | Location |
| Bath cryostat system | 06/14/2006 | 29,121 | 133 | MEP |
| Impact tester | 06/07/2005 | 34,000 | 125 | MMI |
| Nicomp 380 submicron particle size analyzer w/zeta potential | 02/01/2005 | 53,182 | 113 | MMI |
| TA Instruments Q400 Thermomechanical analyzer | 10/23/2003 | 46,158 | 127 | MMI |
| Hot disk base w/desktop computer | 05/20/2003 | 62,000 | 113 | MMI |
| Specimen mounting press | 05/15/2003 | 8,979 | 124 | MMI |
| TA Instruments Q100 Differential scanning calorimeter | 04/15/2003 | 36,039 | 127 | MMI |
| TA Instruments Q800 Dynamic mechanical analyzer | 04/15/2003 | 51,683 | 102 | MCM |
| Leco image analysis system (upgrade) | 04/15/2003 | 15,597 | 124B | MMI |
| Microtrac Laser particle analyzer | 02/13/2003 | 44,076 | 113 | MMI |
| Manning Polymer modulator | 11/21/2002 | 22,390 | 123 | MMI |
| Rheometric Minature materials tester | 08/31/1998 | 9,500 | 124B | MMI |
| Microscope, Olympus | 06/29/1998 | 27,137 | 324 | MMI |
| Flotation machine cell | 06/12/1996 | 5,000 | 130 | MMI |
| Jaw crusher | 06/12/1996 | 5,000 | 130 | MMI |
| Tester, microhardness | 10/01/1994 | 16,000 | 125 | MMI |
| Goniometer | 06/01/1993 | 13,253 | 127 | MMI |
| Computer system IBM | 06/01/1992 | 36,279 | 102 | MMI |
| Grinder, dimple | 07/01/1991 | 8,280 | 128C | MMI |
| Image Analysis System | 09/01/1990 | 70,500 | 124B | MMI |
| Furnace, induction | 04/01/1990 | 63,414 | 121 | MMI |
| Furnace, tube/controller | 06/01/1989 | 5,039 | 130A | MMI |

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| Table C-2 Capital assets acquired before 2010 (Cont’d) |
| Asset Description | Acq Date | Amount | Room  | Location |
| Ion Millier Fischion | 12/01/1993 | 48,157 | 240 | MEP |
| Goniometer | 06/01/1993 | 13,253 | 127 | MMI |
| Computer system IBM | 06/01/1992 | 36,279 | 102 | MMI |
| Grinder, dimple | 07/01/1991 | 8,280 | 128C | MMI |
| Image Analysis System | 09/01/1990 | 70,500 | 124B | MMI |
| Furnace, induction | 04/01/1990 | 63,414 | 121 | MMI |
| Furnace, tube/controller | 06/01/1989 | 5,039 | 130A | MMI |
| Separator, magnetic | 10/01/1987 | 8,000 | 126 | MMI |
| Furnace, triple console | 12/01/1976 | 5,268 | 128B | MMI |
| Test System, MTS | 10/01/1974 | 23,917 | 125 | MMI |
| Spectrometer, mass | 07/01/1974 | 23,280 | 121 | MMI |
| Rolling mill w/drive | 12/01/1962 | 14,917 | 125 | MMI |

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