

APPENDIX

Appendix 1: N₂ Physisorption SA Isotherms of supports

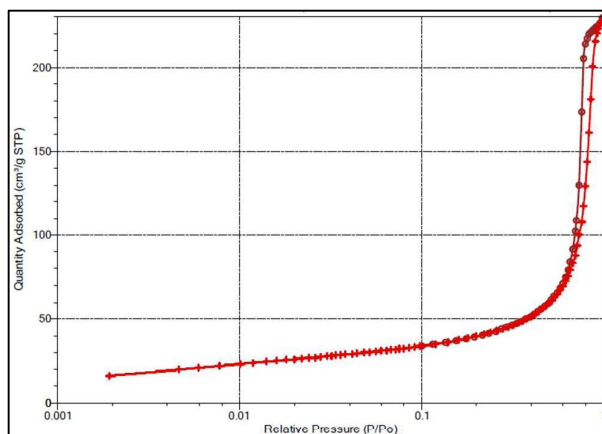


Figure A1.1: N₂ physisorption Isotherm for AMZ-89-0-0

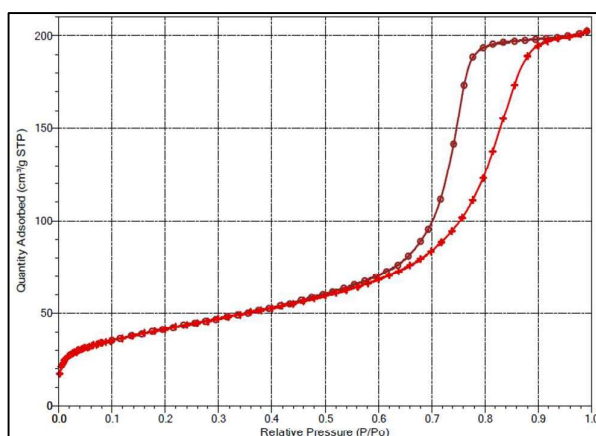


Figure A2.2: N₂ physisorption Isotherm for AMZ-0-89-0

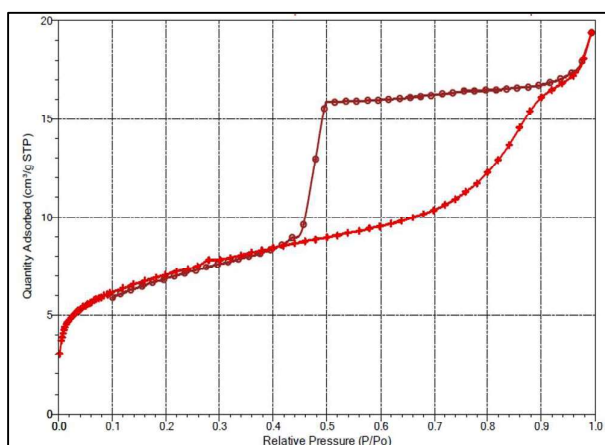


Figure A1.3: N₂ physisorption Isotherm for AMZ-0-0-89

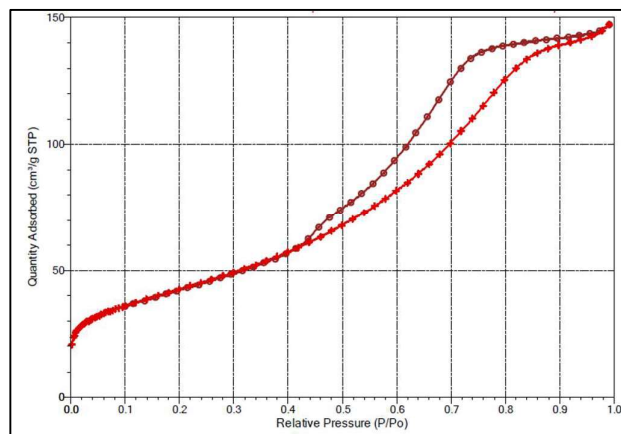


Figure A1.4: N₂ physisorption Isotherm for AMZ-44-44-0

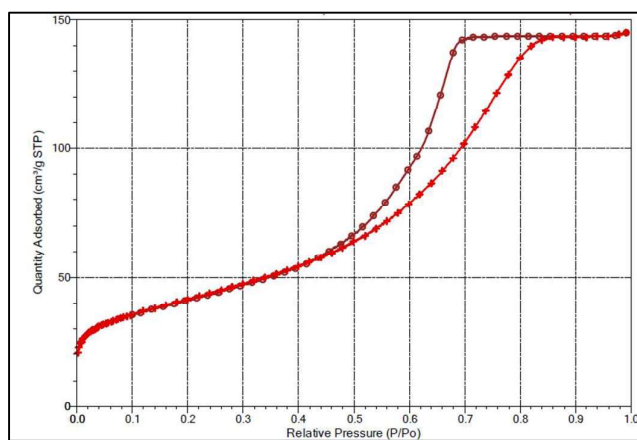


Figure A1.5: N₂ physisorption Isotherm for AMZ-0-44-44

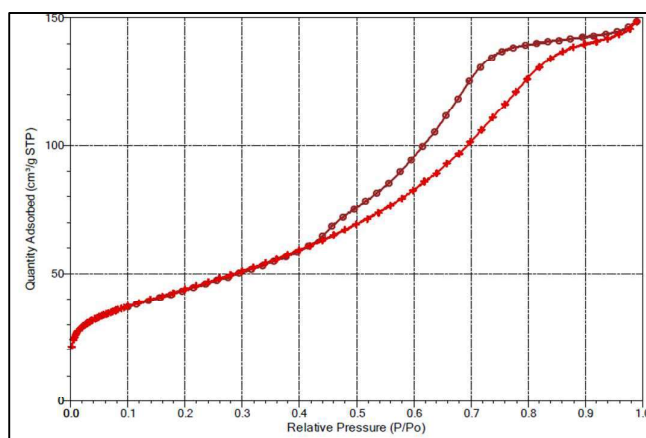


Figure A1.6: N₂ physisorption Isotherm for AMZ-44-0-44

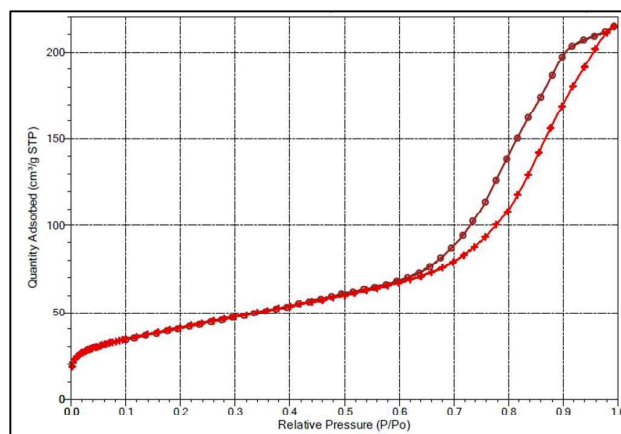


Figure A1.7: N₂ physisorption Isotherm for AMZ-39-49-0

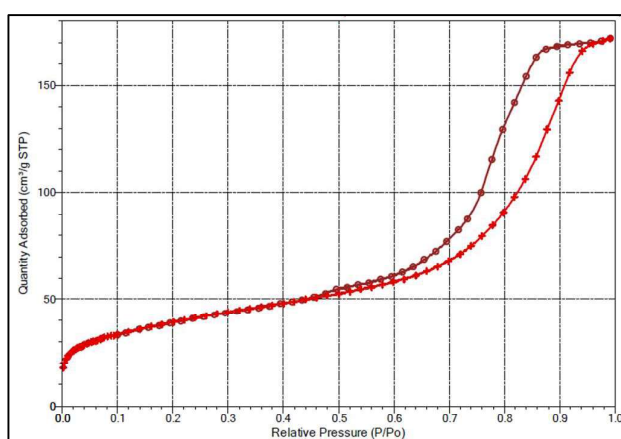


Figure A1.8: N₂ physisorption Isotherm for AMZ-29-59-0

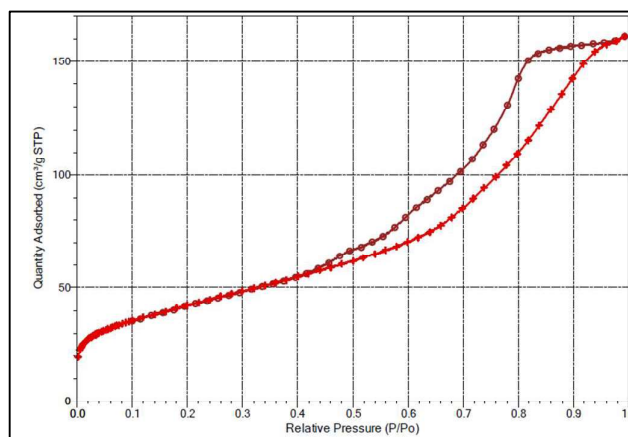


Figure A1.9: N₂ physisorption Isotherm for AMZ-39-0-49

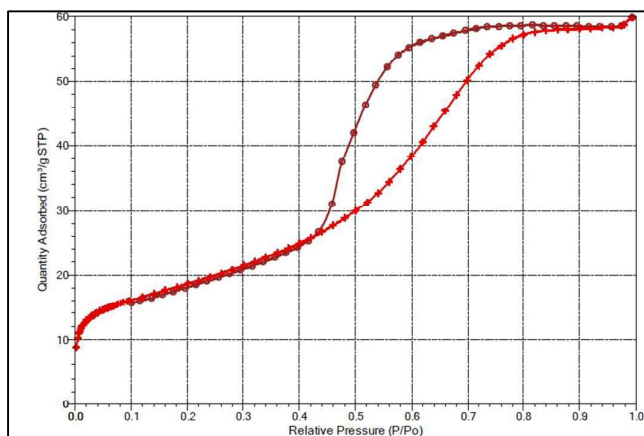


Figure A1.10: N₂ physisorption Isotherm for AMZ-29-0-59

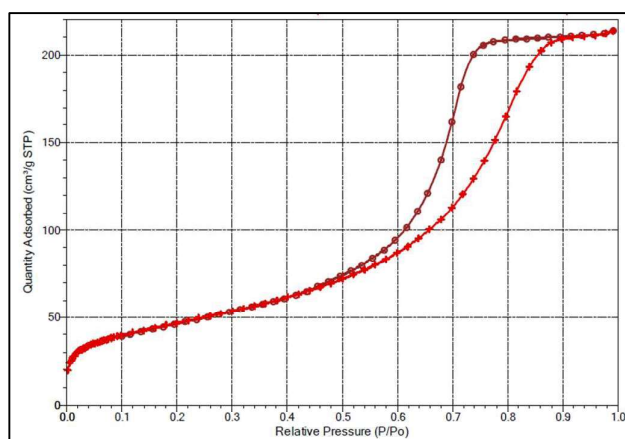


Figure A1.11: N₂ physisorption Isotherm for AMZ-44-22-22

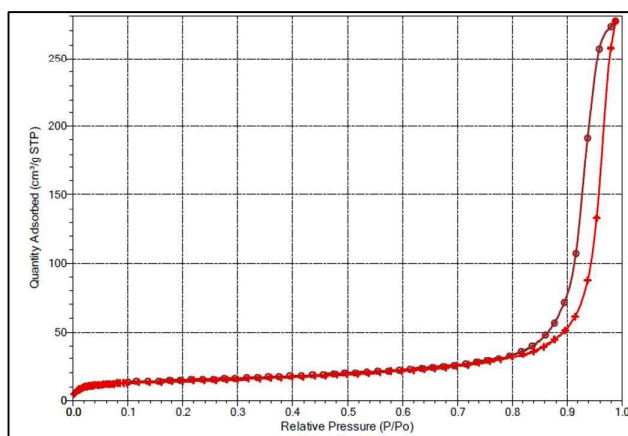


Figure A1.12: N₂ physisorption Isotherm for AMZ-22-44-22

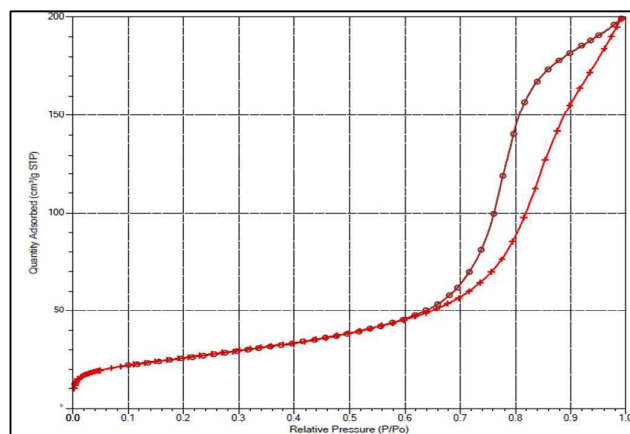


Figure A1.13: N₂ physisorption Isotherm for AMZ-22-22-44

Appendix 2: NH₃-TPD plots of Supports

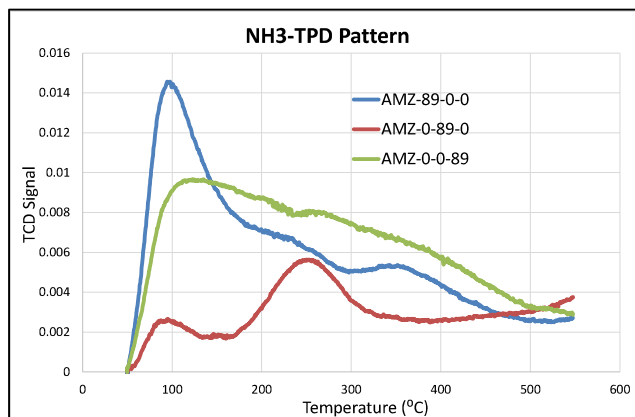


Figure A2.1: NH₃-TPD of AMZ-89-0-0, AMZ-0-89-0 and AMZ-0-0-89

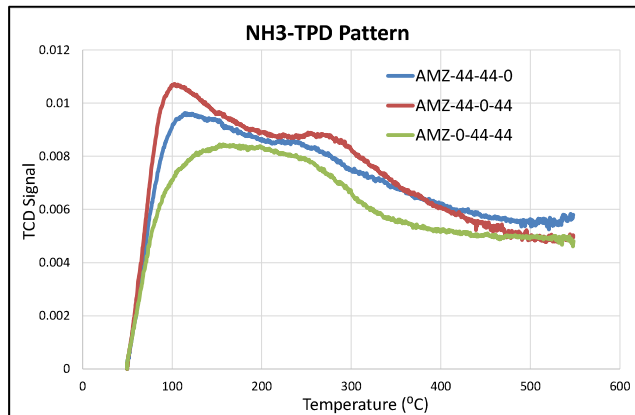


Figure A2.2: NH₃-TPD of AMZ-44-44-0, AMZ-0-44-44 and AMZ-44-0-44

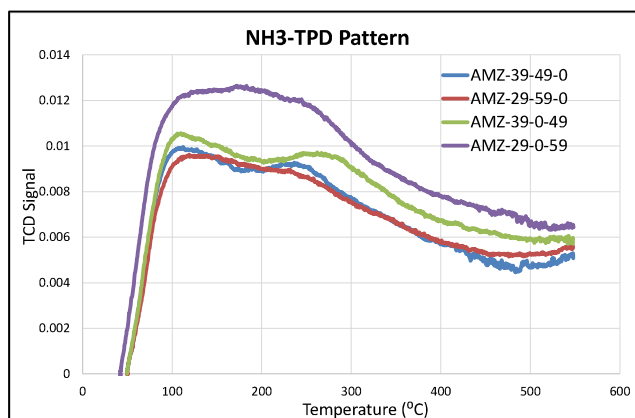


Figure 2.3: NH₃-TPD of AMZ-39-49-0, AMZ-29-59-0, AMZ-39-0-49 and AMZ-29-0-59

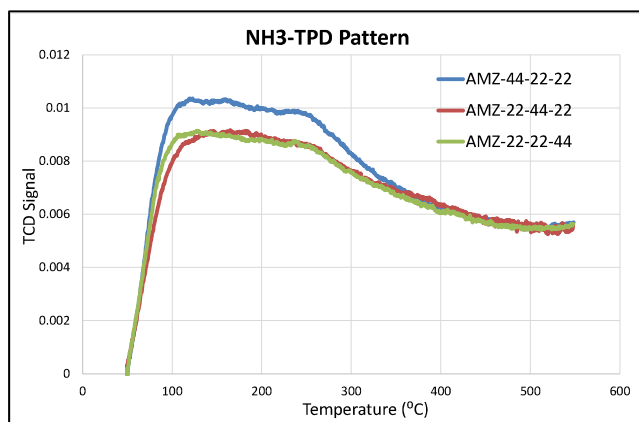


Figure A2.4: NH₃-TPD of AMZ-44-22-22, AMZ-22-44-22 and AMZ-22-22-44

Appendix 3: XRD Graphs of support

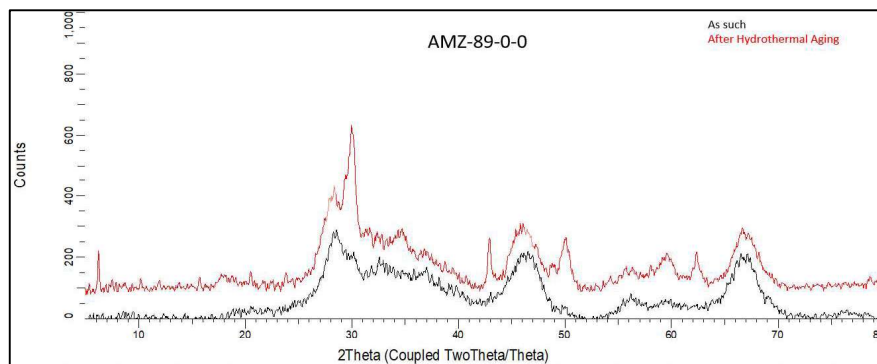


Figure A3.1: XRD Patterns for AMZ-89-0-0

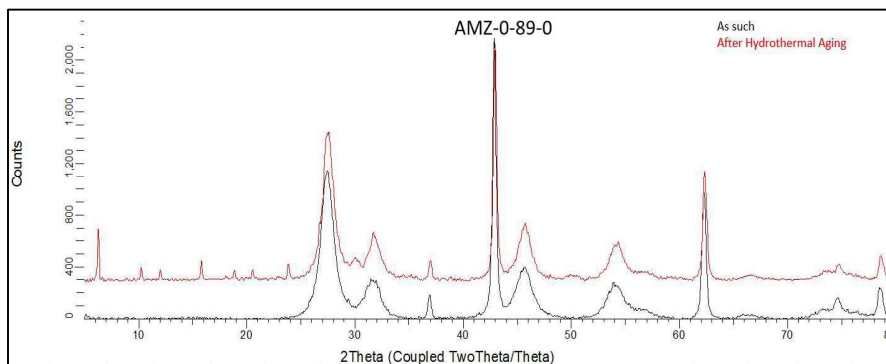


Figure A3.2: XRD Patterns for AMZ-0-89-0

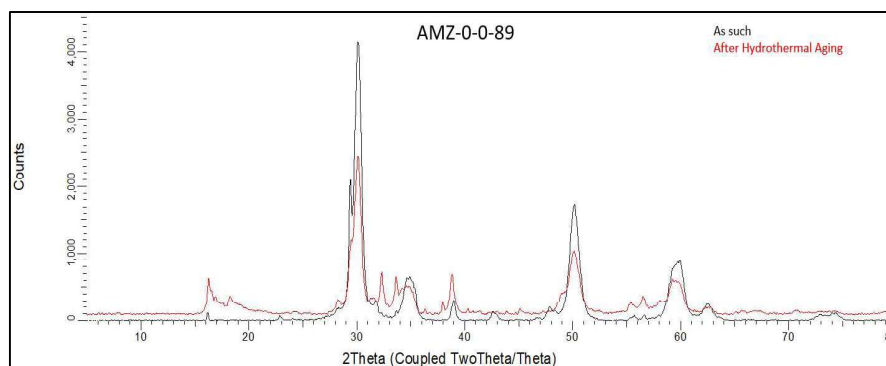


Figure A3.3: XRD Patterns for AMZ-0-0-89

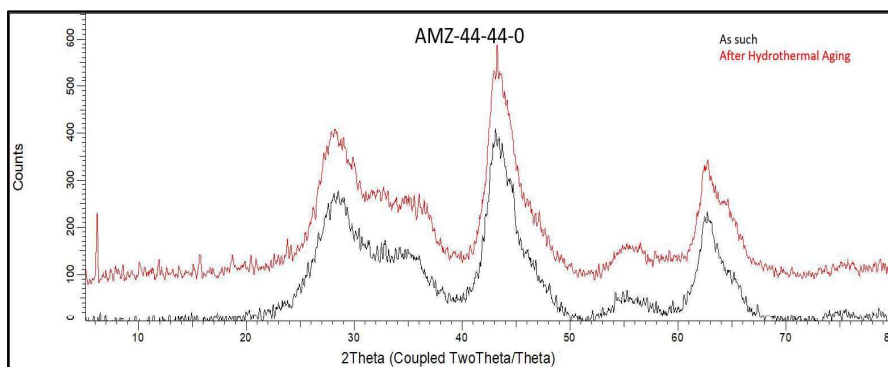


Figure A3.4: XRD Patterns for AMZ-44-44-0

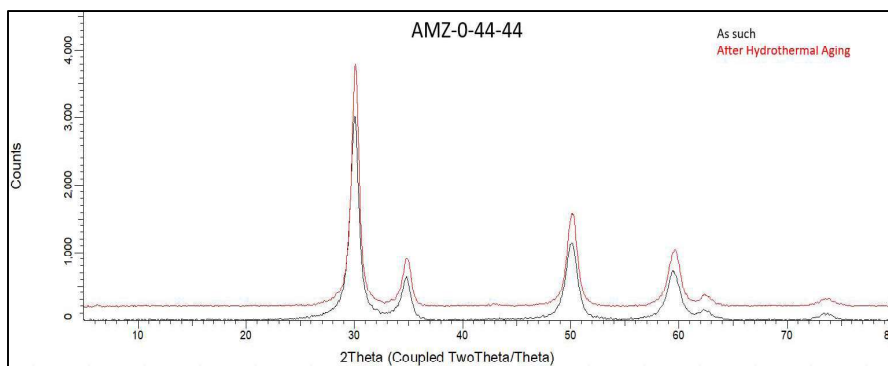


Figure A3.5: XRD Patterns for AMZ-0-44-44

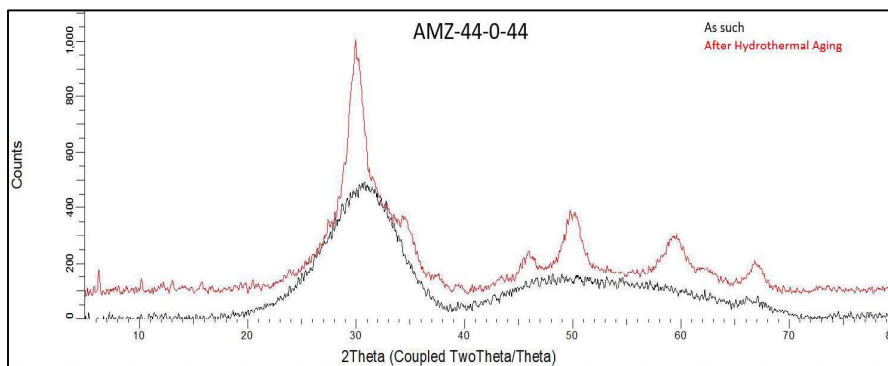


Figure A3.6: XRD Patterns for AMZ-44-0-44

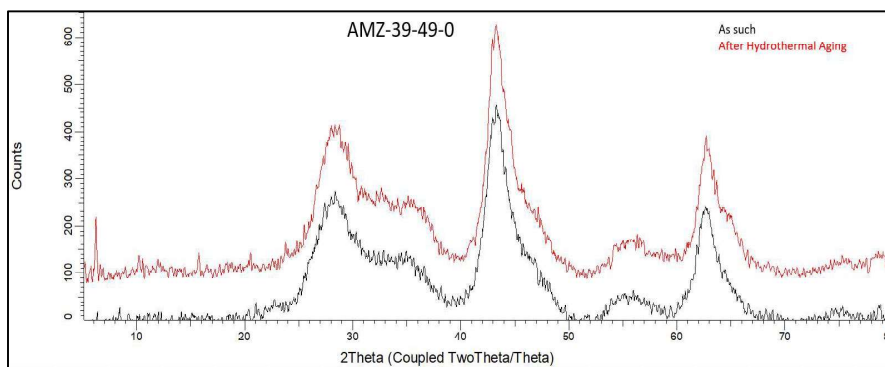


Figure A3.7: XRD Patterns for AMZ-39-49-0

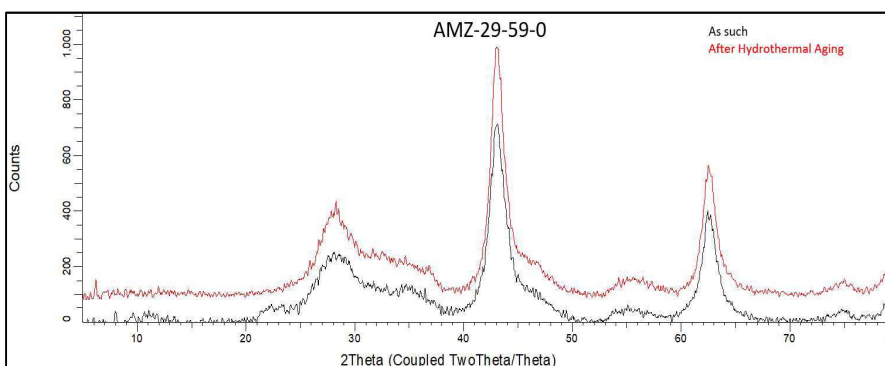


Figure A3.8: XRD Patterns for AMZ-29-59-0

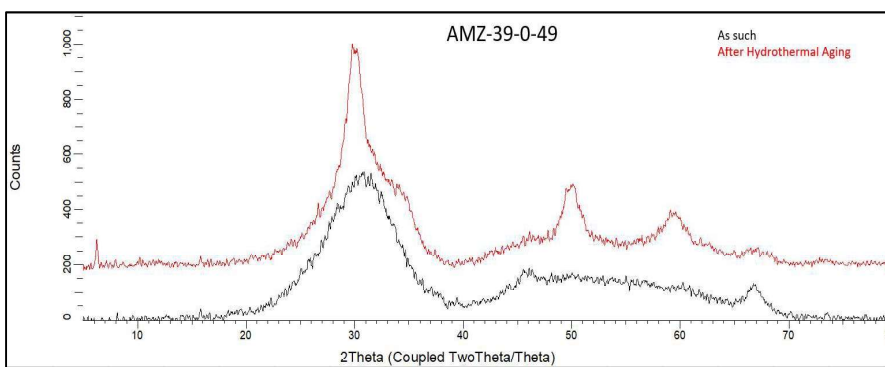


Figure A3.9: XRD Patterns for AMZ-39-0-49

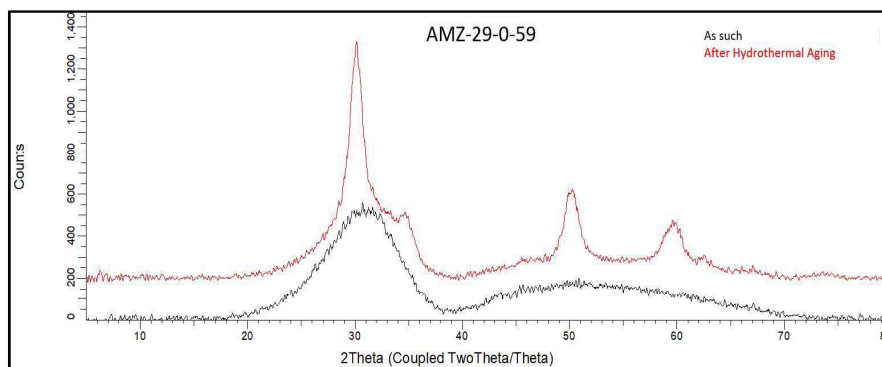


Figure A3.10: XRD Patterns for AMZ-29-0-59

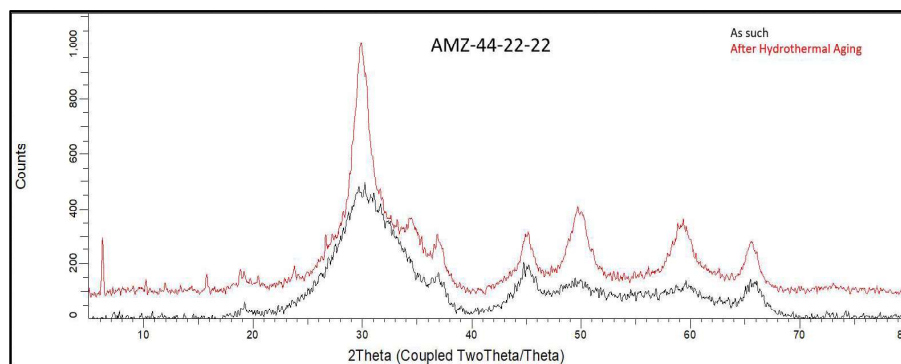


Figure A3.11: XRD Patterns for AMZ-44-22-22

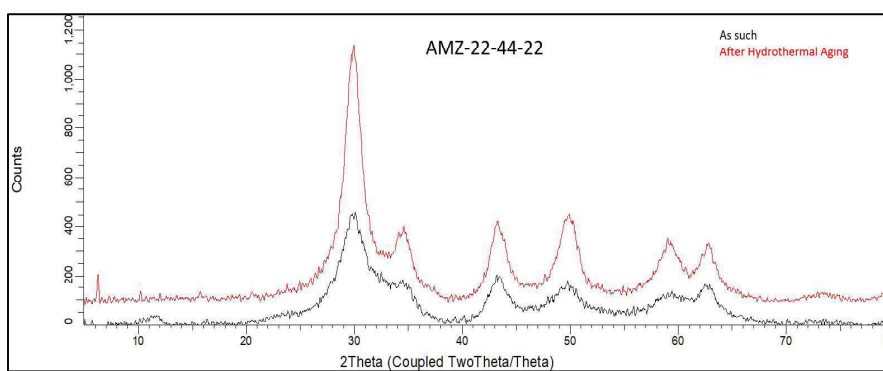


Figure A3.12: XRD Patterns for AMZ-22-44-22

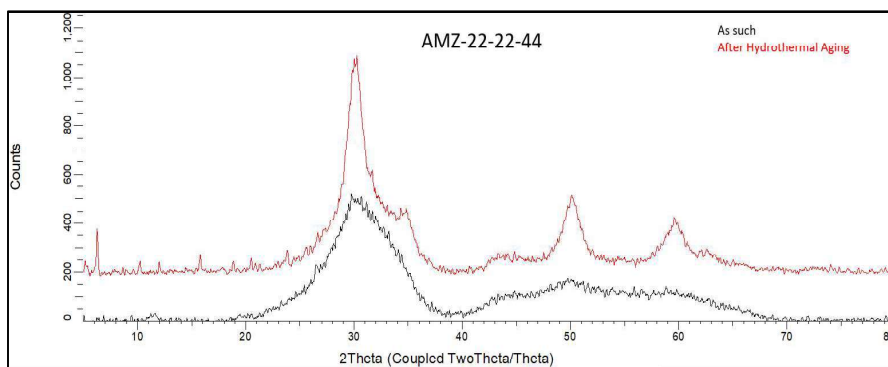


Figure A3.13: XRD Patterns for AMZ-22-22-44

Appendix 4: DSC-TGA Graphs of Support

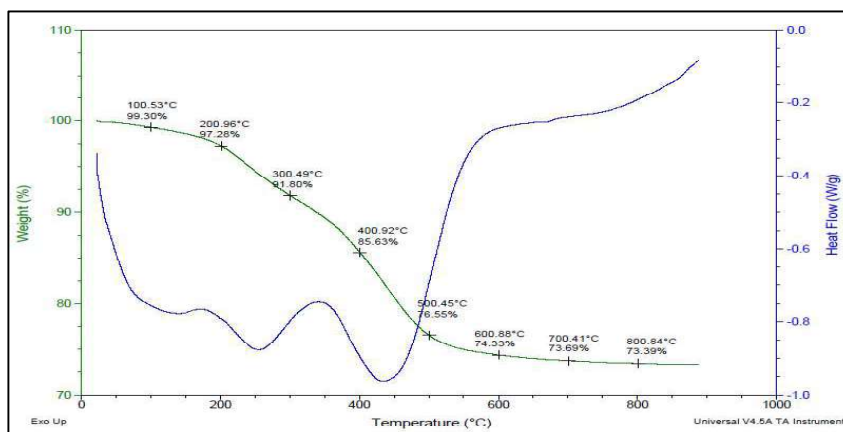


Figure A4.1: DSC-TGA patterns for AMZ-89-0-0

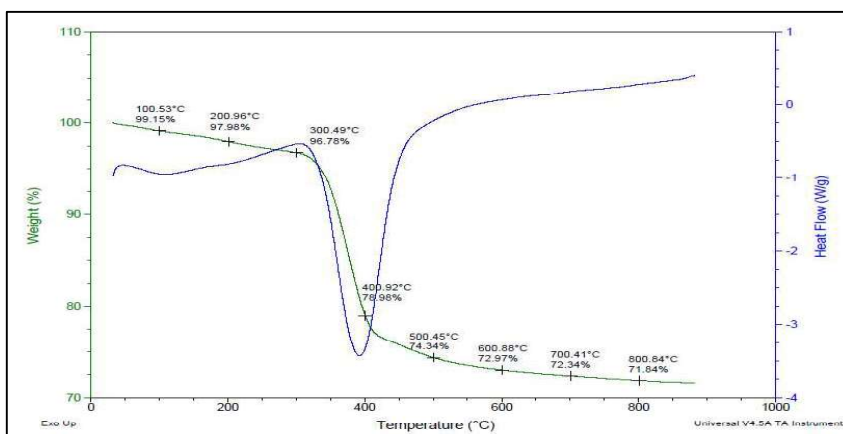


Figure A4.2: DSC-TGA patterns for AMZ-0-89-0

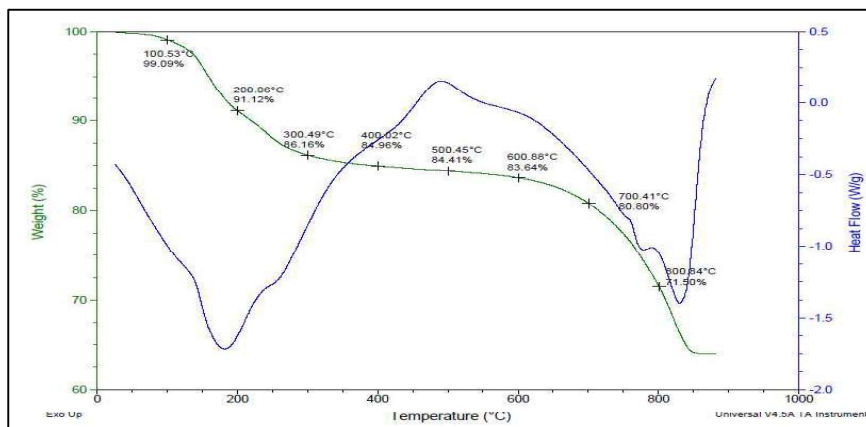


Figure A4.3: DSC-TGA patterns for AMZ-0-0-89

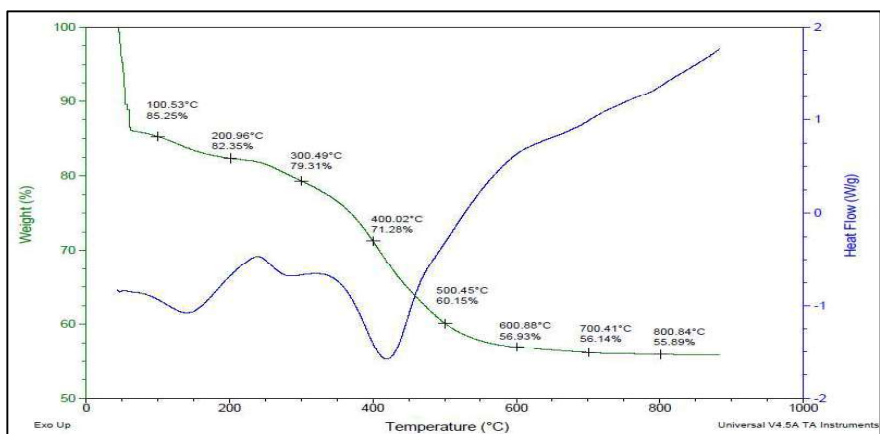


Figure A4.4: DSC-TGA patterns for AMZ-44-44-0

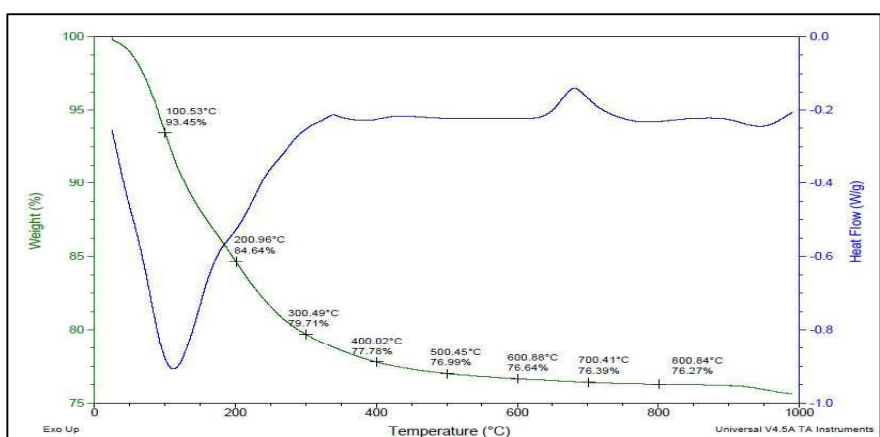


Figure A4.5: DSC-TGA patterns for AMZ-0-44-44

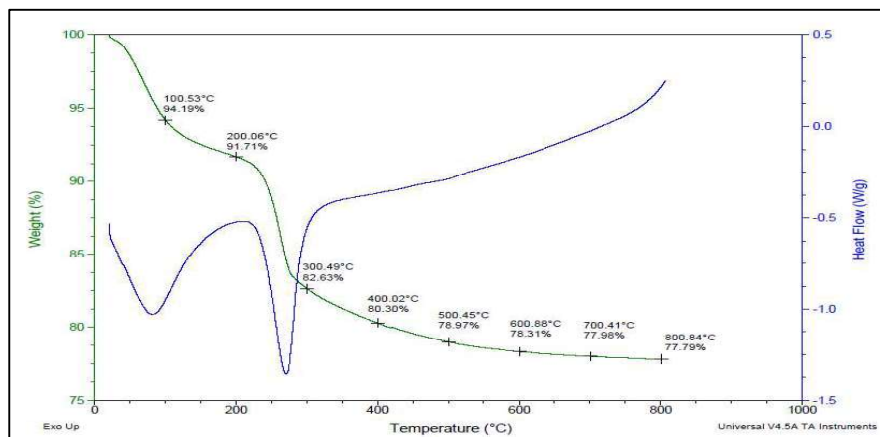


Figure A4.6: DSC-TGA patterns for AMZ-44-0-44

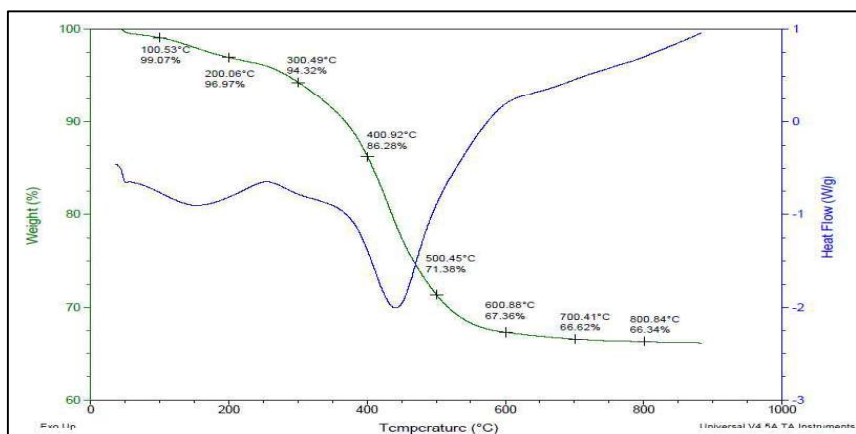


Figure A4.7: DSC-TGA patterns for AMZ-39-49-0

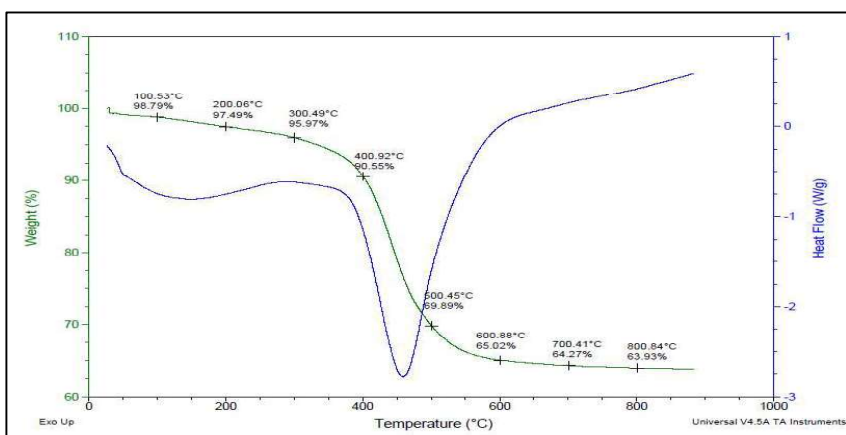


Figure A4.8: DSC-TGA patterns for AMZ-29-59-0

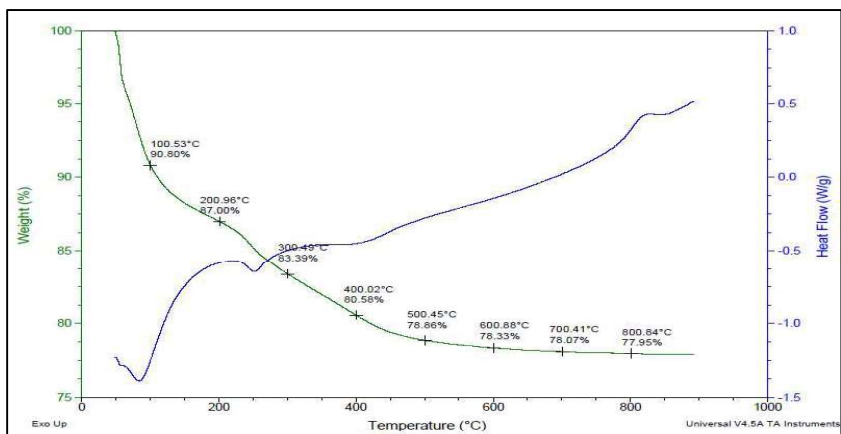


Figure A4.9: DSC-TGA patterns for AMZ-39-0-49

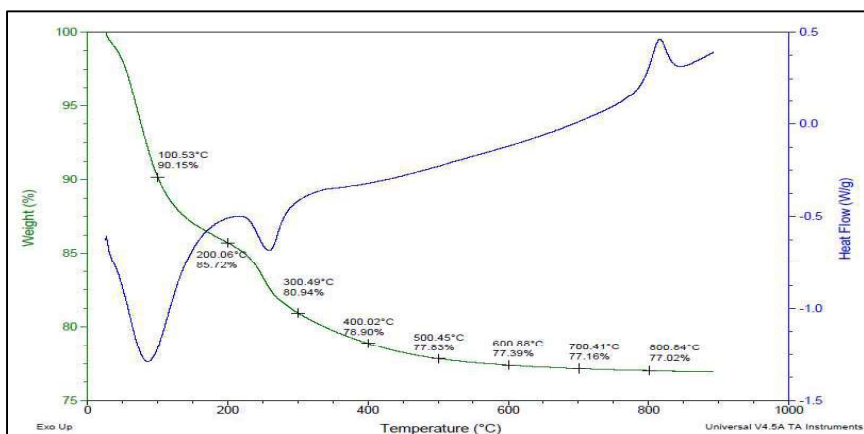


Figure A4.10: DSC-TGA patterns for AMZ-29-0-59

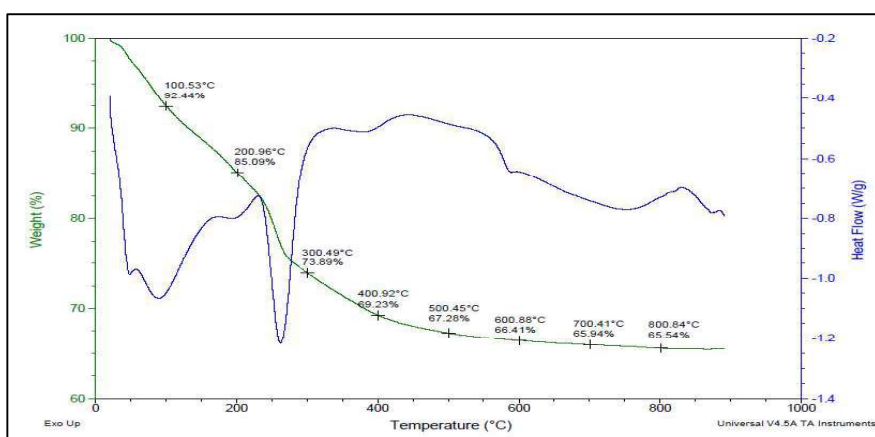


Figure A4.11: DSC-TGA patterns for AMZ-44-22-22

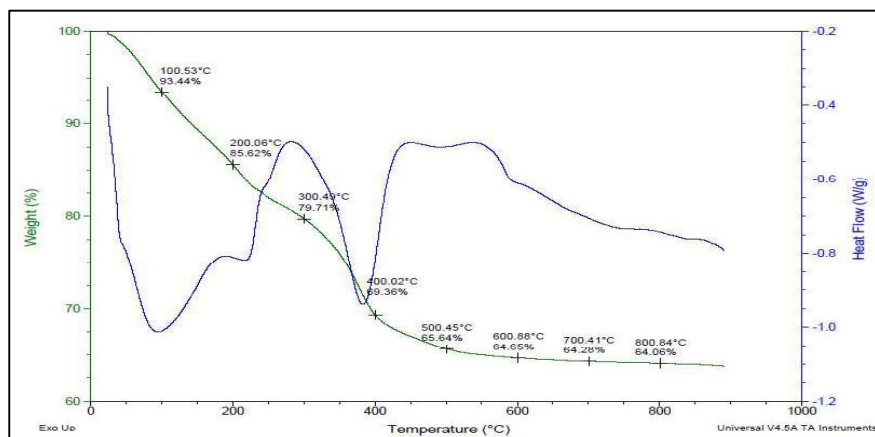


Figure A4.12: DSC-TGA patterns for AMZ-22-44-22

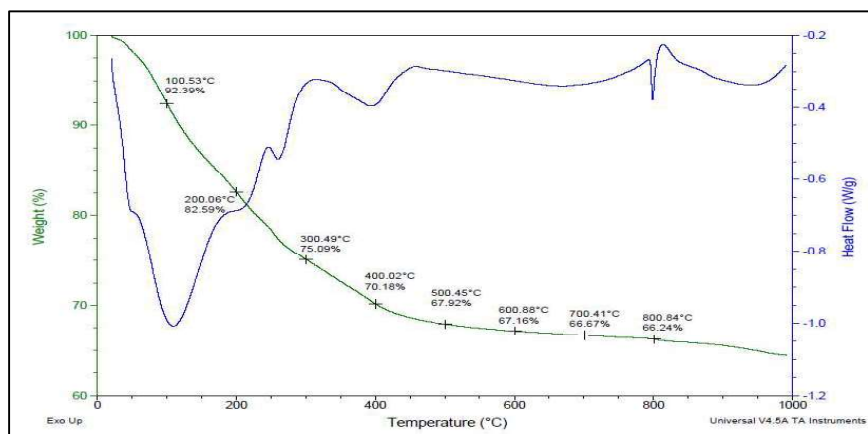


Figure A4.13: DSC-TGA patterns for AMZ-22-22-44

Appendix 5: FTIR Spectra of Support

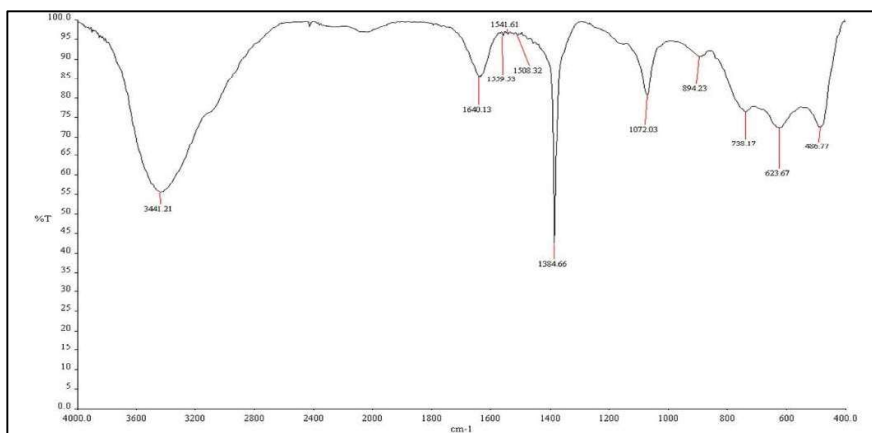


Figure A5.1: FTIR Spectra for AMZ-89-0-0

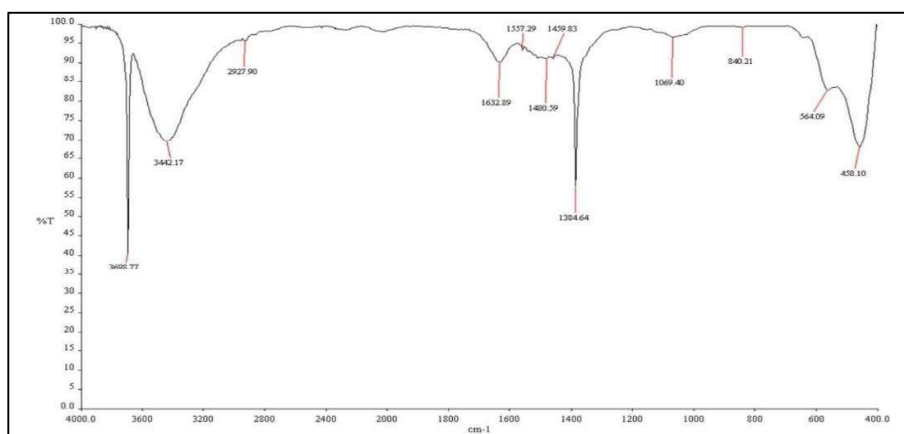


Figure A5.2: FTIR Spectra for AMZ-0-89-0

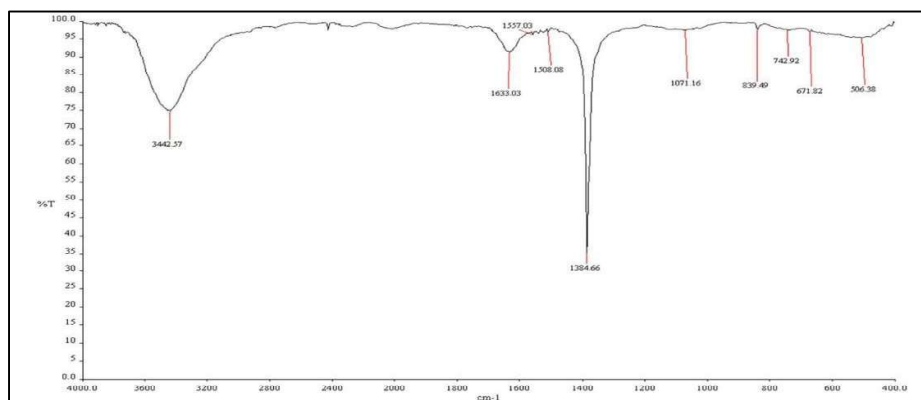


Figure A5.3: FTIR Spectra for AMZ-0-0-89

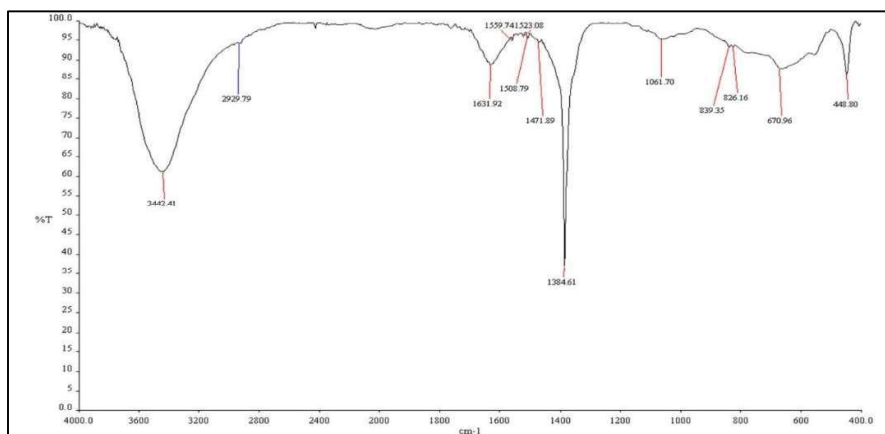


Figure A5.4: FTIR Spectra for AMZ-44-44-0

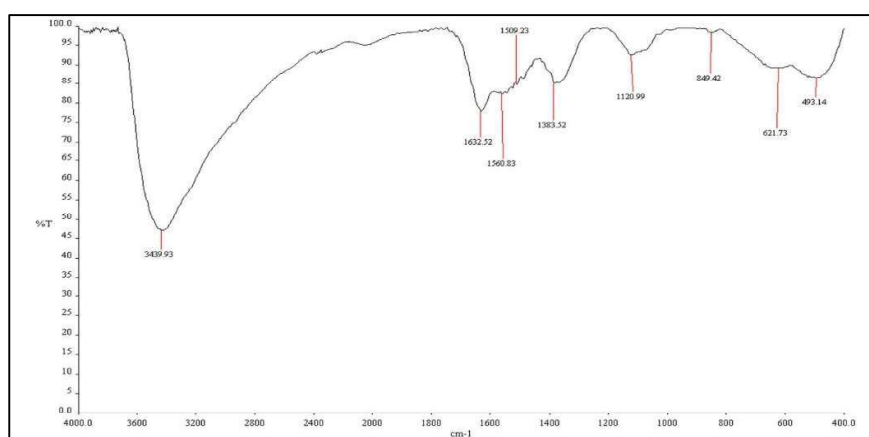


Figure A5.5: FTIR Spectra for AMZ-0-44-44

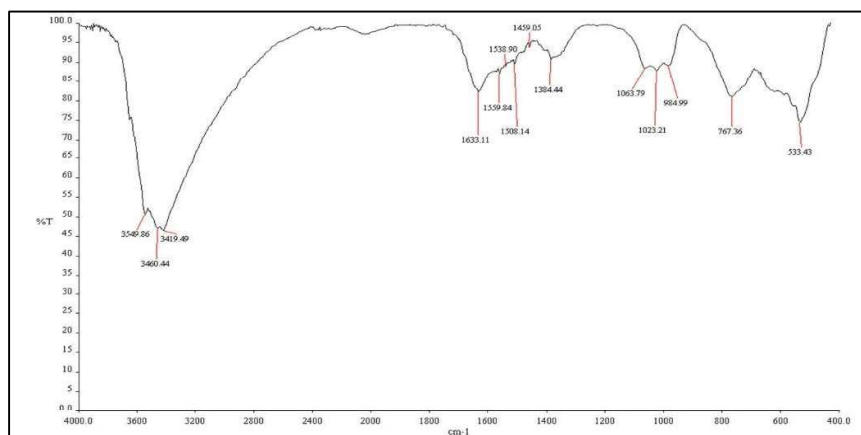


Figure A5.6: FTIR Spectra for AMZ-44-0-44

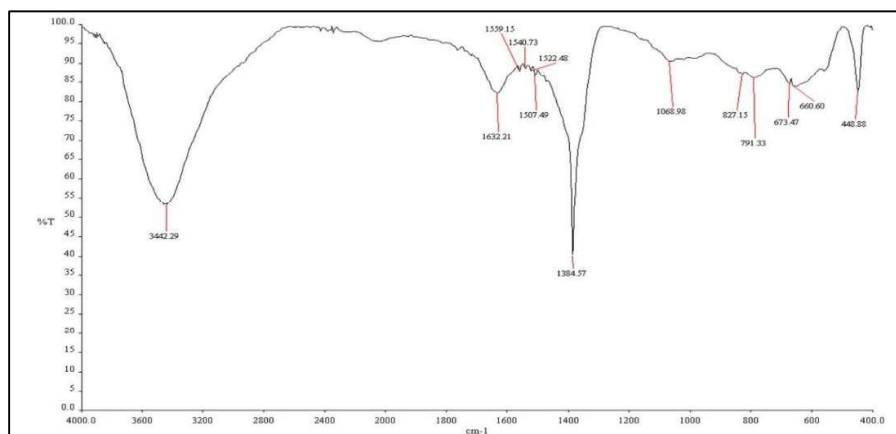


Figure A5.7: FTIR Spectra for AMZ-39-49-0

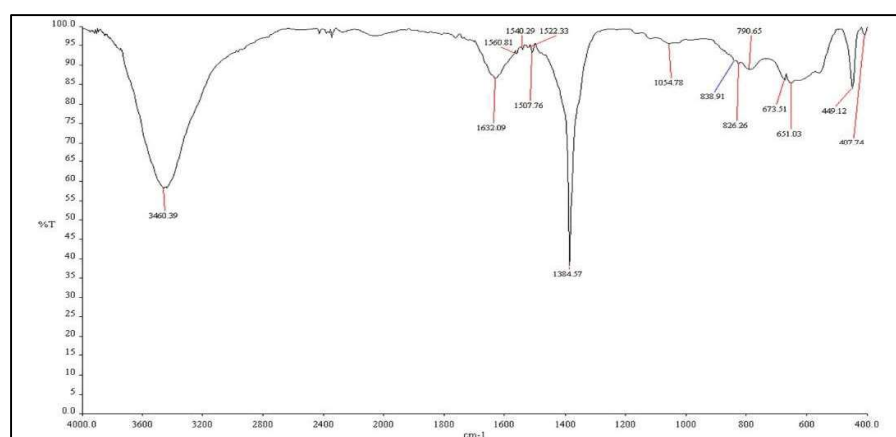


Figure A5.8: FTIR Spectra for AMZ-29-59-0

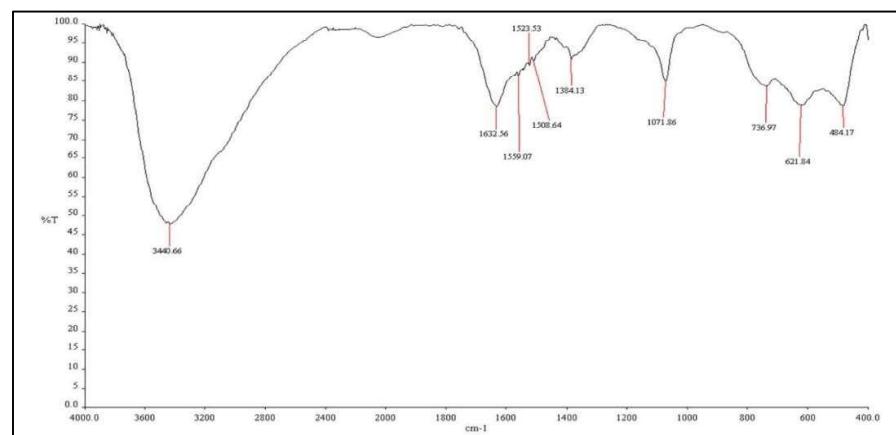


Figure A5.9: FTIR Spectra for AMZ-39-0-49

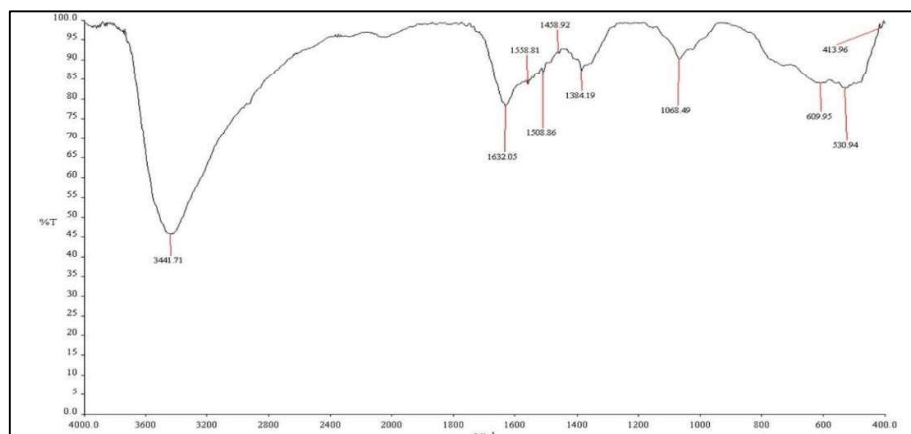


Figure A5.10: FTIR Spectra for AMZ-29-0-59

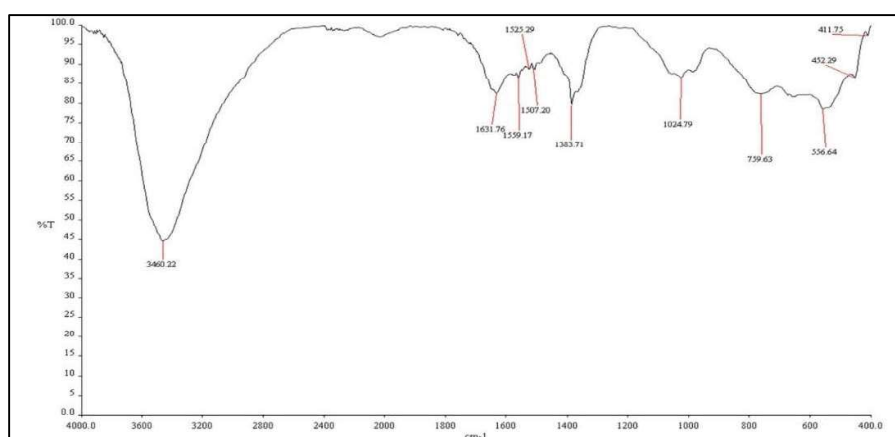


Figure A5.11: FTIR Spectra for AMZ-44-22-22

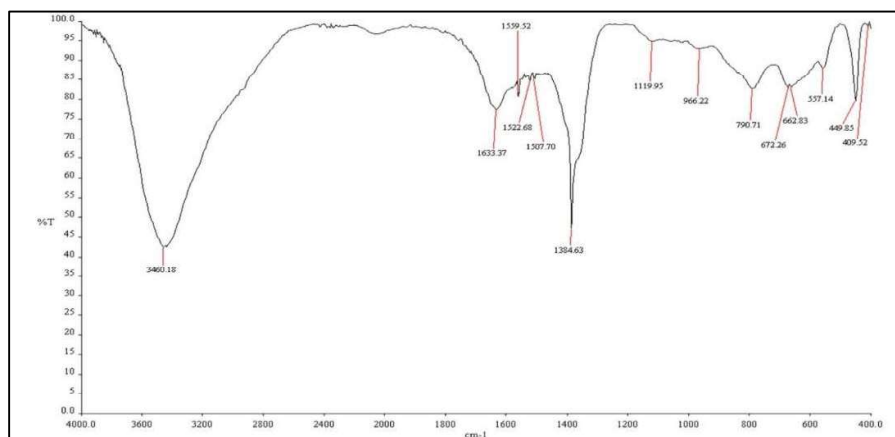


Figure A5.12: FTIR Spectra for AMZ-22-44-22

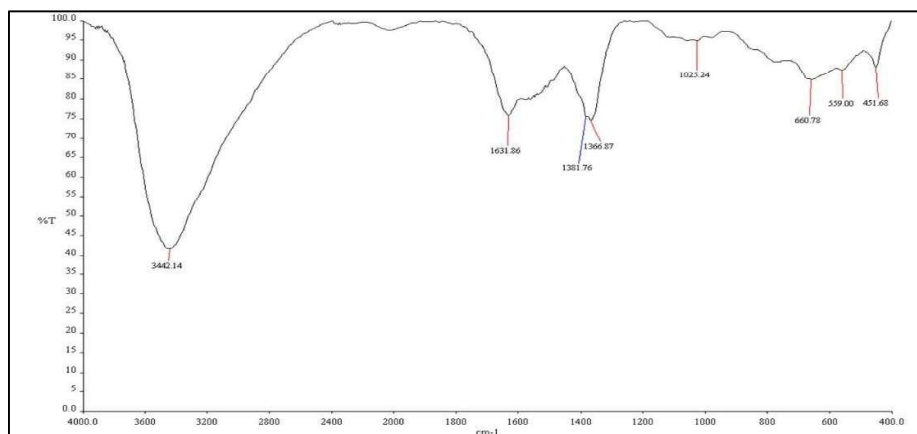


Figure A5.13: FTIR Spectra for AMZ-22-22-44

Appendix 6: NH₃-TPD plots of Catalysts

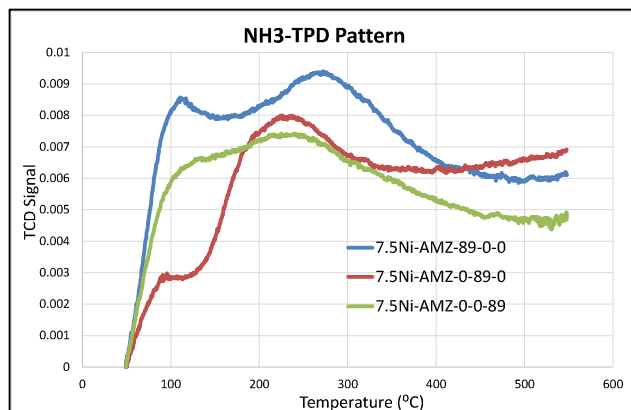


Figure A6.1: NH₃-TPD of 7.5Ni-AMZ-89-0-0, 7.5Ni-AMZ-0-89-0 and 7.5Ni-AMZ-0-0-89

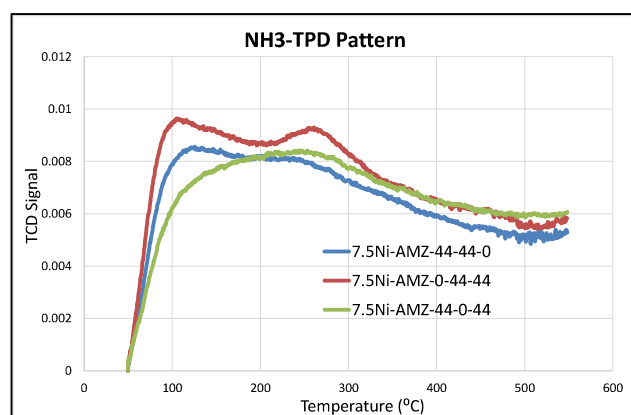


Figure A6.2: NH₃-TPD of 7.5Ni-AMZ-44-44-0, 7.5Ni-AMZ-0-44-44 and 7.5Ni-AMZ-44-0-44

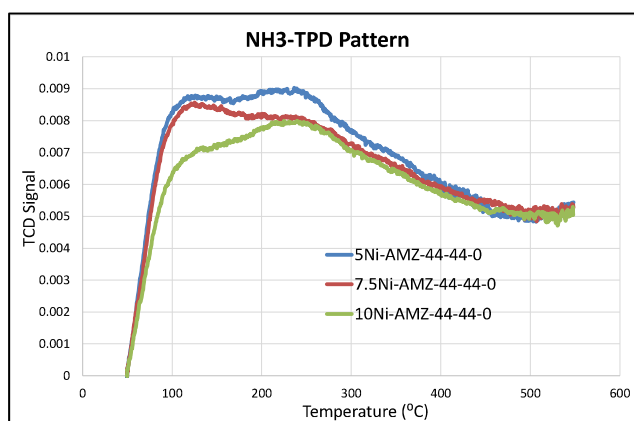


Figure A6.3: NH₃-TPD of 5Ni-AMZ-44-44-0, 7.5Ni-AMZ-44-44-0 and 10Ni-AMZ-44-44-0

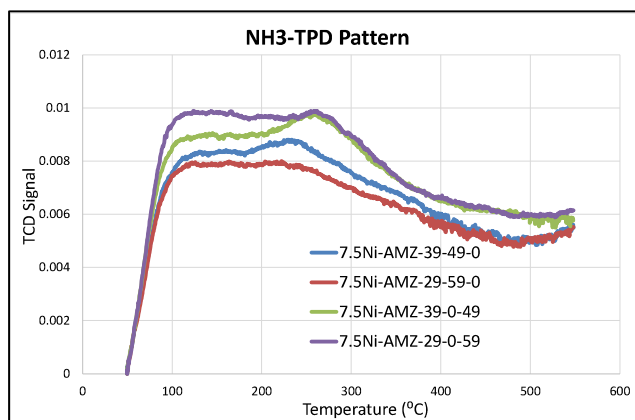


Figure A6.4: NH₃-TPD of 7.5Ni-AMZ-39-49-0, 7.5Ni-AMZ-29-59-0, 7.5Ni-AMZ-39-0-49 and 7.5Ni-AMZ-29-0-59

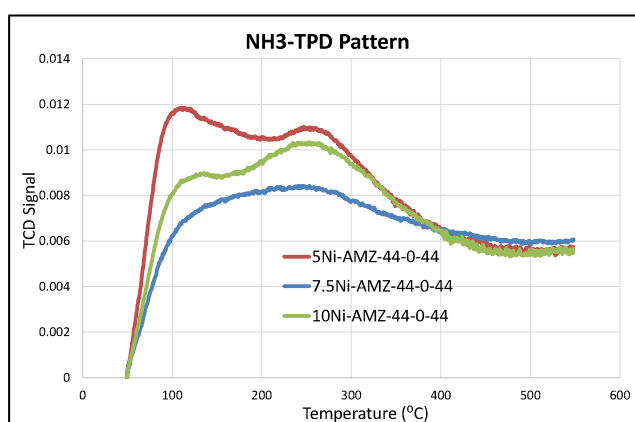


Figure A6.5: NH₃-TPD of 5Ni-AMZ-44-0-44, 7.5Ni-AMZ-44-0-44 and 10Ni-AMZ-44-0-44

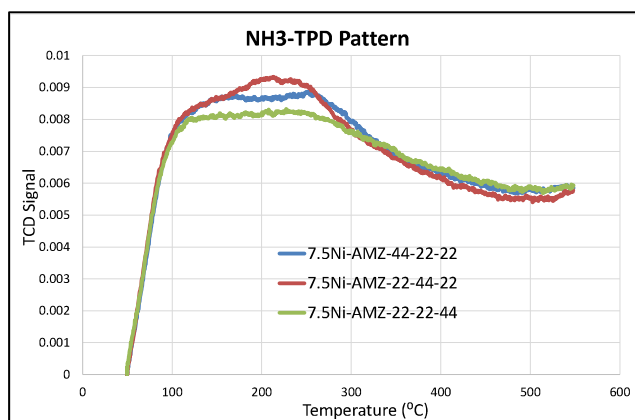


Figure A6.6: NH₃-TPD of 5Ni-AMZ-44-22-22, 7.5Ni-AMZ-22-44-22 and 10Ni-AMZ-22-22-44

Appendix 7: TPR plots of Catalysts

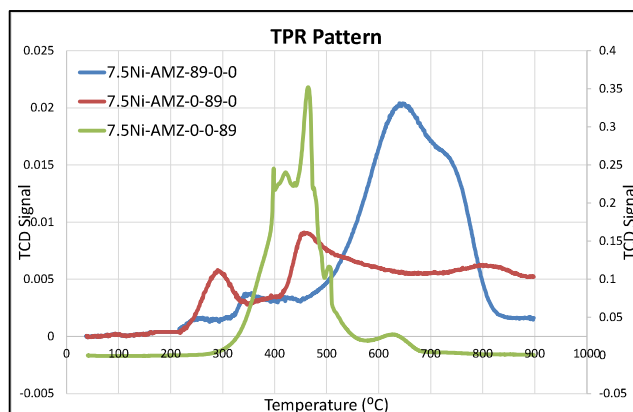


Figure A7.1: TPR of 7.5Ni-AMZ-89-0-0, 7.5Ni-AMZ-0-89-0 and 7.5Ni-AMZ-0-0-89

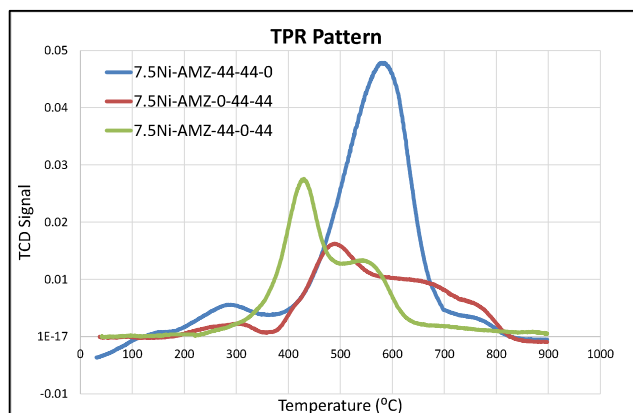


Figure A7.2: TPR of 7.5Ni-AMZ-44-44-0, 7.5Ni-AMZ-0-44-44 and 7.5Ni-AMZ-44-0-44

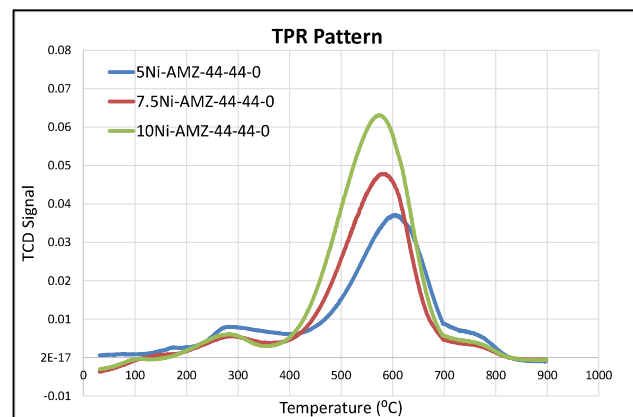


Figure A7.3: TPR of 5Ni-AMZ-44-44-0, 7.5Ni-AMZ-44-44-0 and 10Ni-AMZ-44-44-0

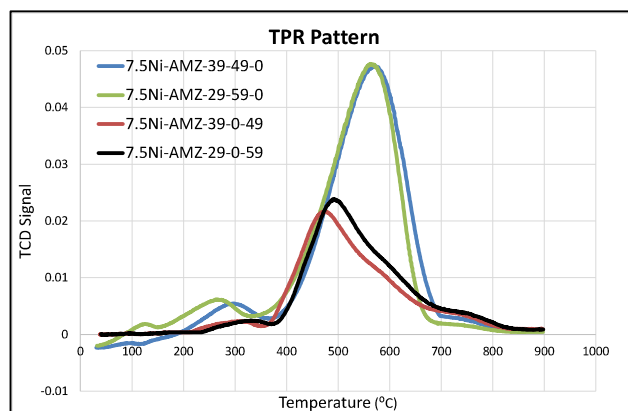


Figure A7.4: TPR of 7.5Ni-AMZ-39-49-0, 7.5Ni-AMZ-29-59-0, 7.5Ni-AMZ-39-0-49 and 7.5Ni-AMZ-29-0-59

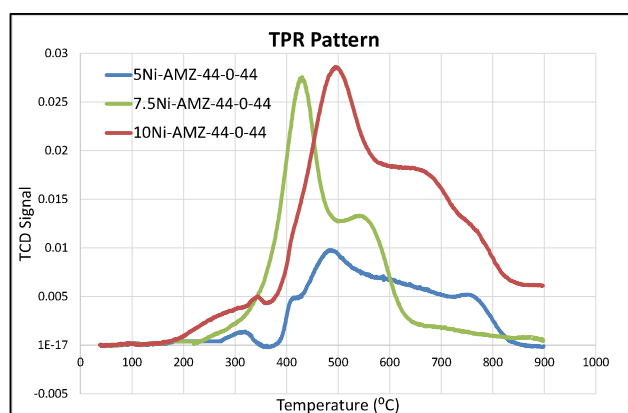


Figure A7.5: TPR of 5Ni-AMZ-44-0-44, 7.5Ni-AMZ-44-0-44 and 10Ni-AMZ-44-0-44

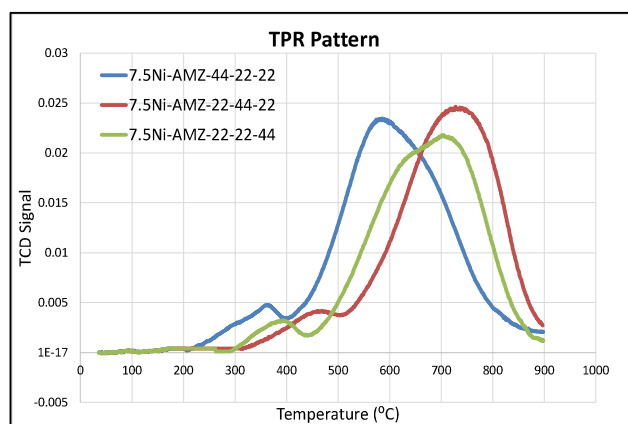


Figure A7.6: TPR of 5Ni-AMZ-44-22-22, 7.5Ni-AMZ-22-44-22 and 10Ni-AMZ-22-22-44

Appendix 8: XRD graphs of Catalysts

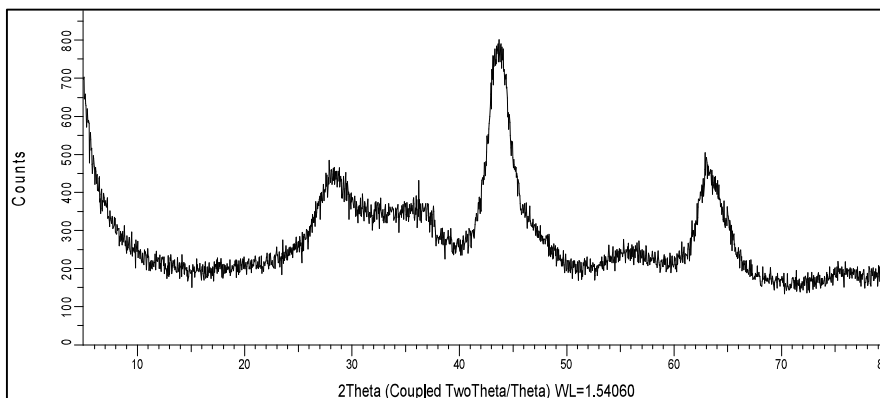


Figure A8.1: XRD of 7.5Ni-AMZ-44-44-0

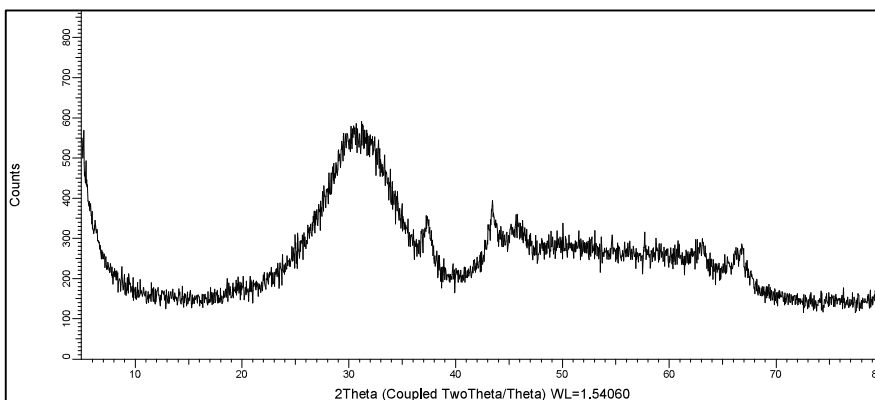


Figure A8.2: XRD of 7.5Ni-AMZ-0-44-44

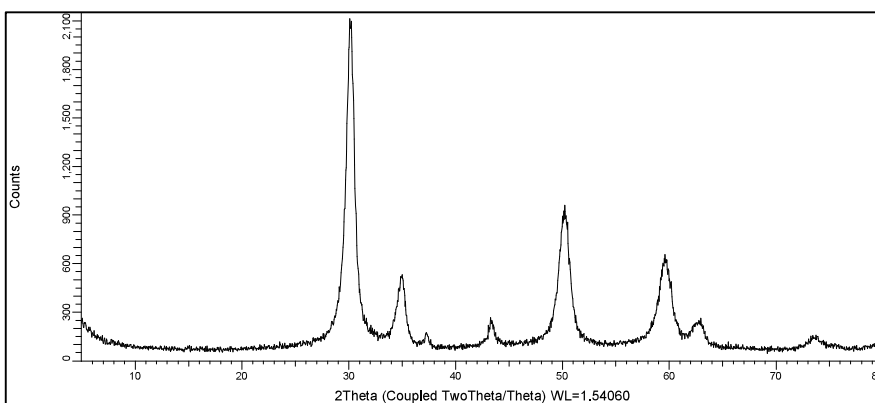


Figure A8.3: XRD of 7.5Ni-AMZ-44-0-44

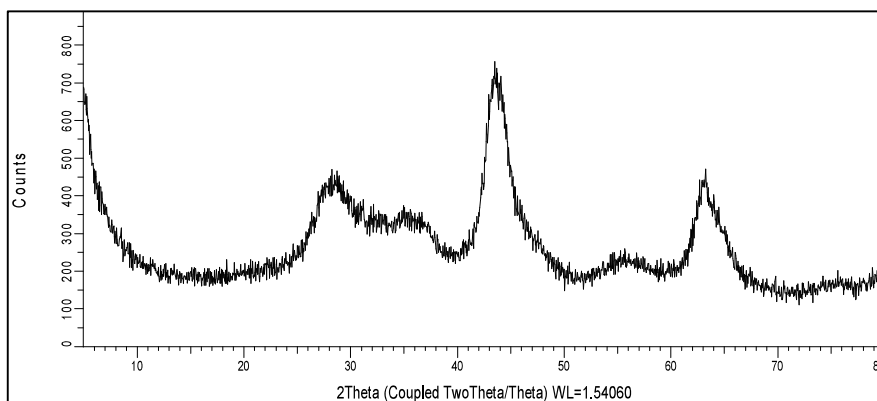


Figure A8.4: XRD of 5Ni-AMZ-44-44-0

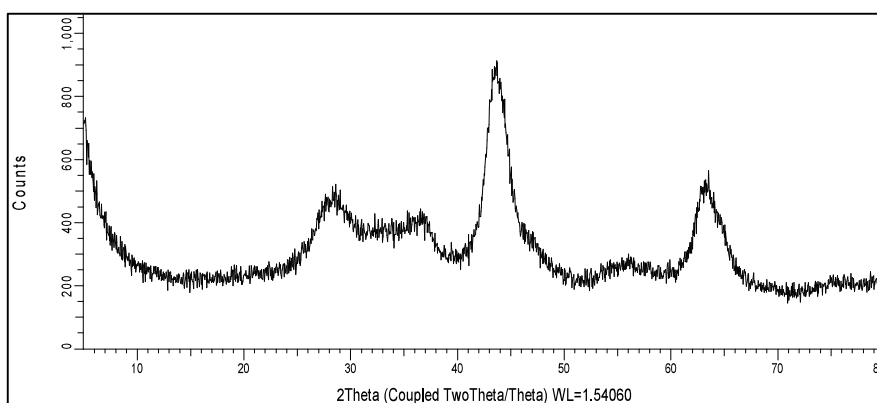


Figure A8.5: XRD of 10Ni-AMZ-44-44-0

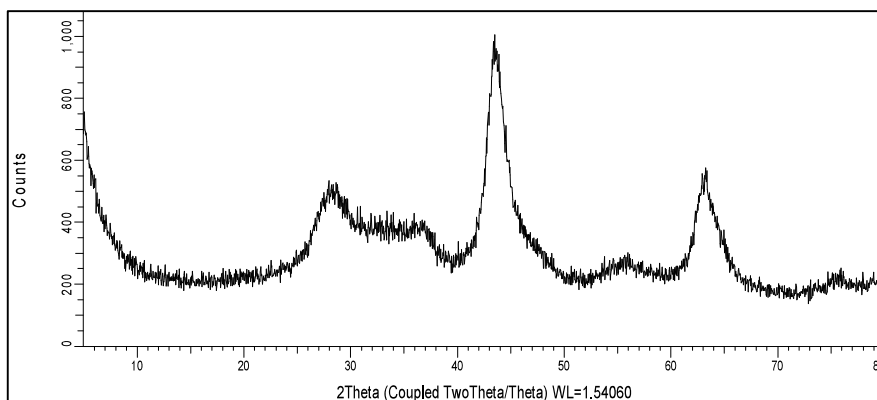


Figure A8.6: XRD of 7.5Ni-AMZ-39-49-0

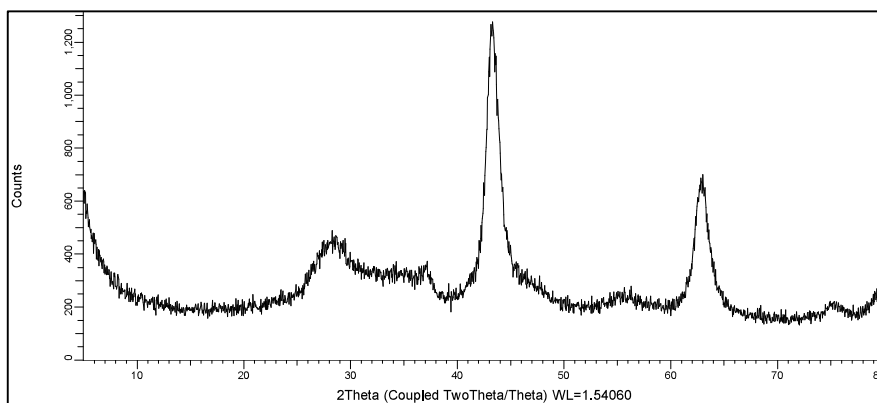


Figure A8.7: XRD of 7.5Ni-AMZ-29-59-0

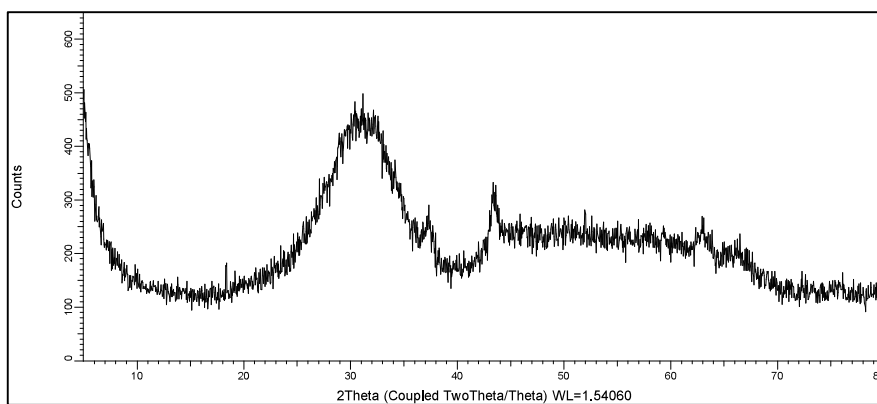


Figure A8.8: XRD of 7.5Ni-AMZ-39-0-49

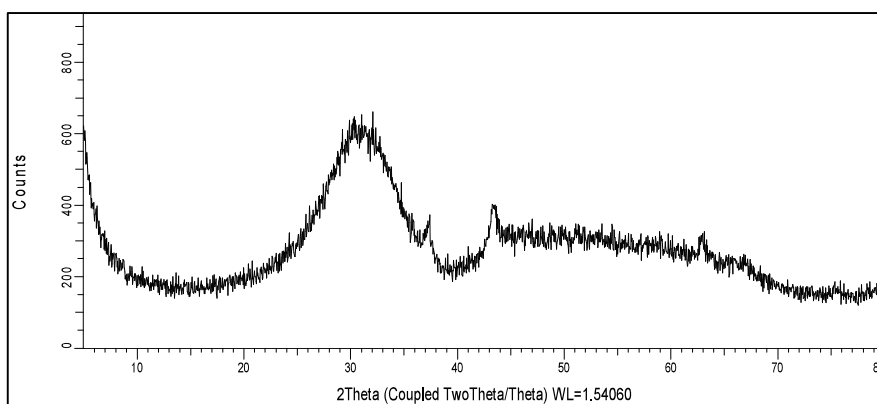


Figure A8.9: XRD of 7.5Ni-AMZ-29-0-59

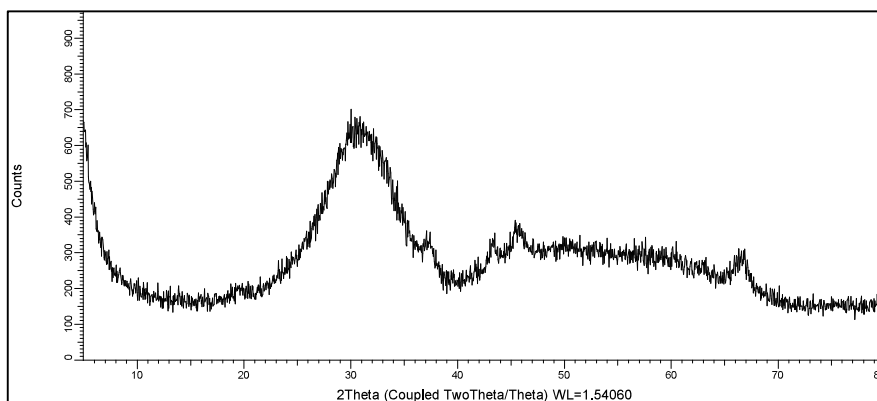


Figure A8.10: XRD of 5Ni-AMZ-44-0-44

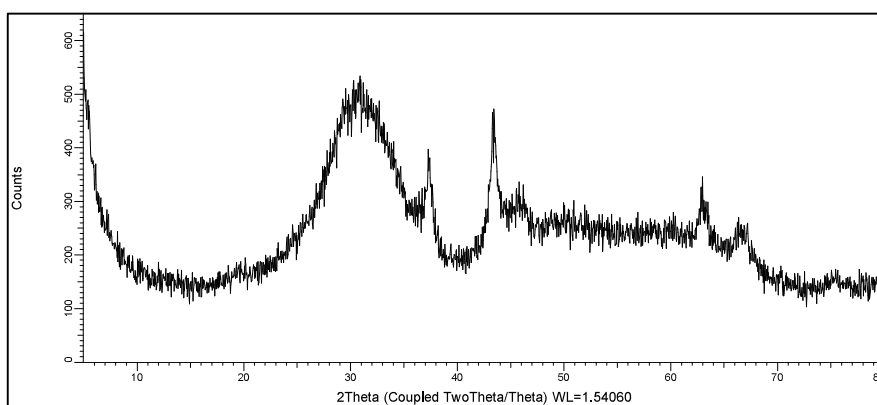


Figure A8.11: XRD of 10Ni-AMZ-44-0-44

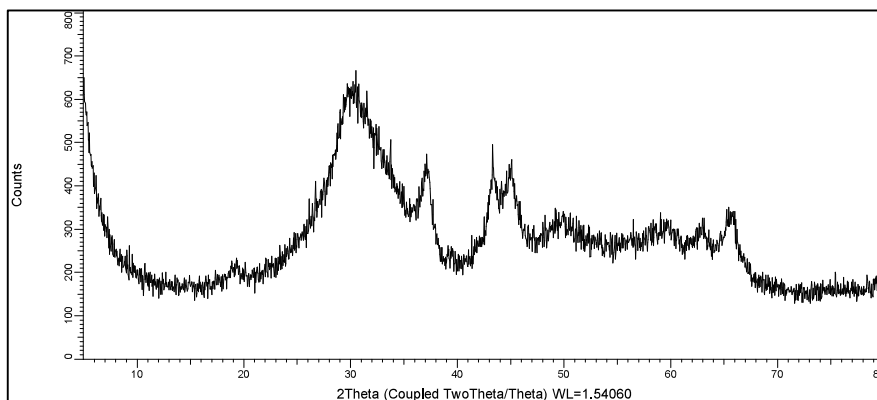


Figure A8.12: XRD of 7.5Ni-AMZ-44-22-22

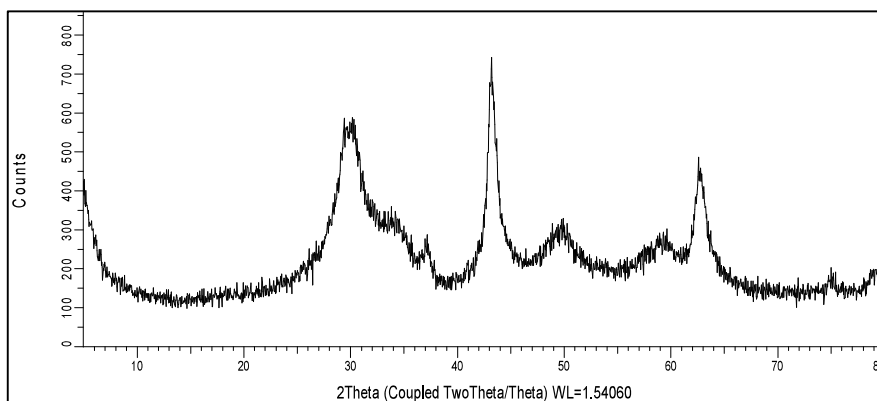


Figure A8.13: XRD of 7.5Ni-AMZ-22-44-22

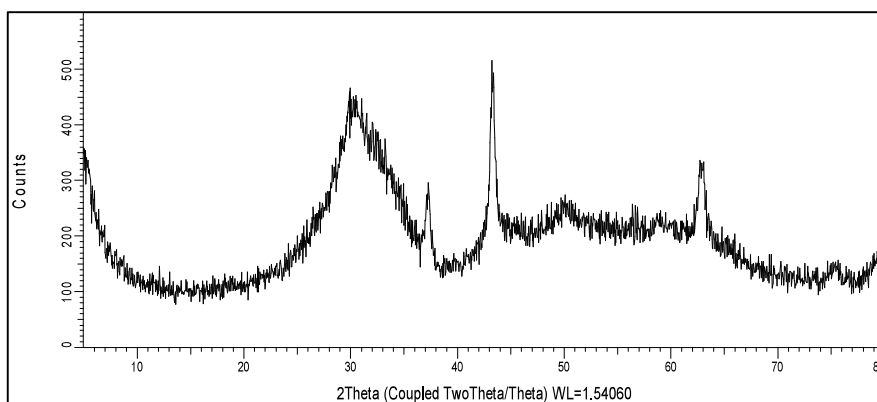


Figure A8.14: XRD of 7.5Ni-AMZ-22-22-44

Appendix 9: Co-relation of XRD NiO Crystallite size with NiO reducibility and Ni Surface Area.

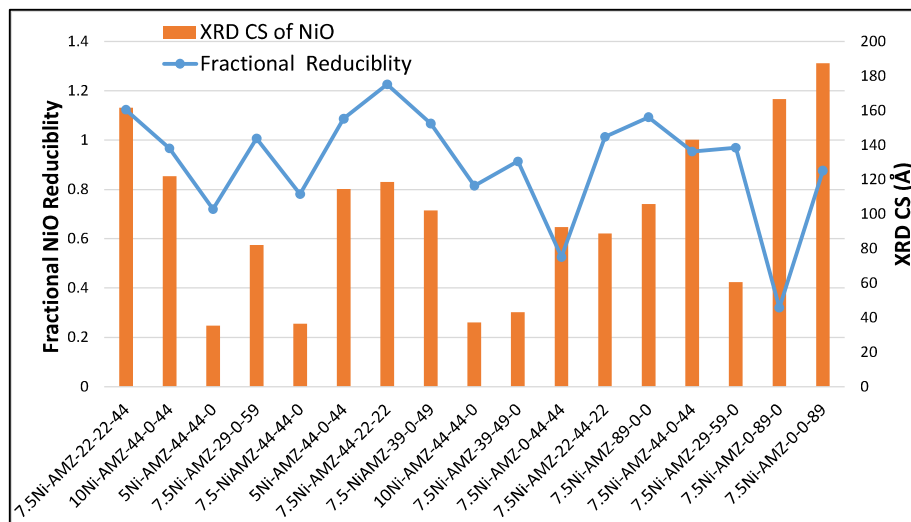


Figure A9.1: Co-relation of NiO Crystallite size with NiO Reducibility

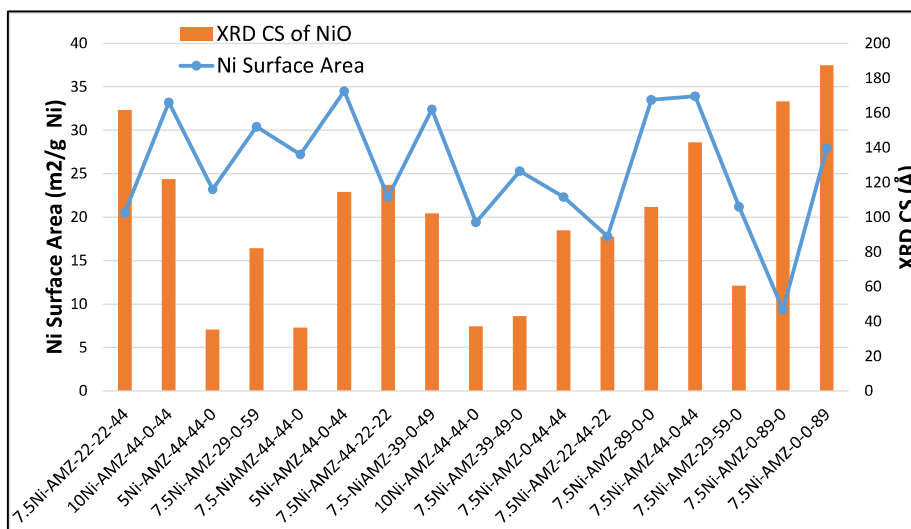


Figure A9.1: Co-relation of NiO Crystallite size with Ni Surface Area

Appendix 10: HRTEM micrographs of calcined catalysts

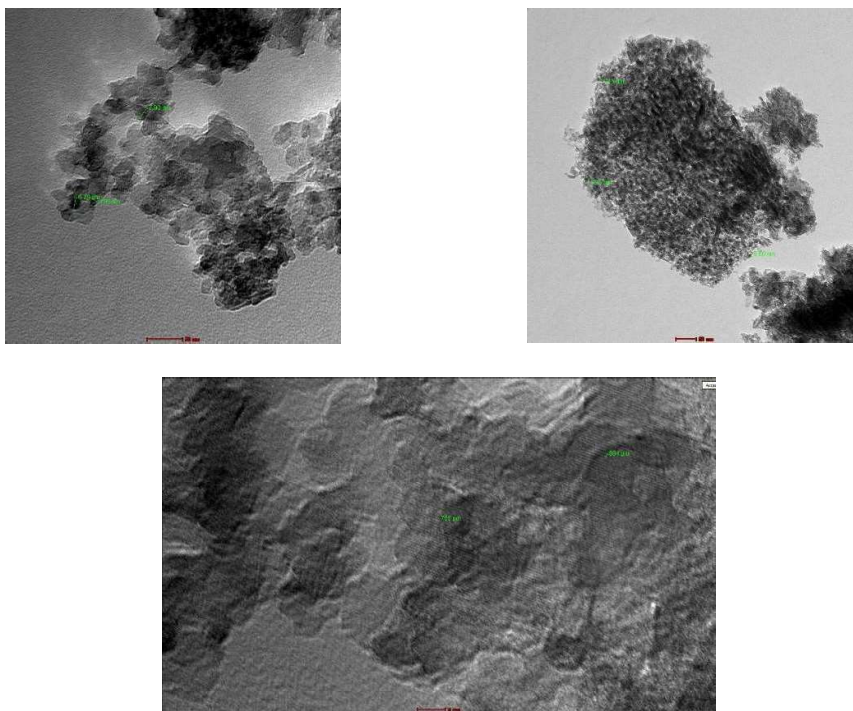


Figure A10.1: HRTEM Images of 5Ni-AMZ-44-44-0

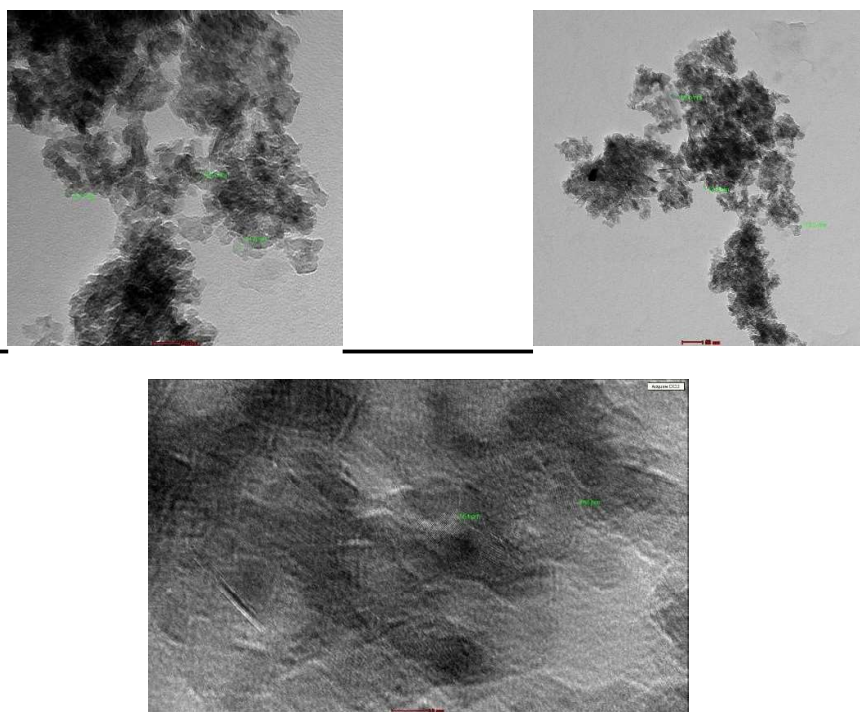


Figure A10.2: HRTEM Images of 10Ni-AMZ-44-44-0

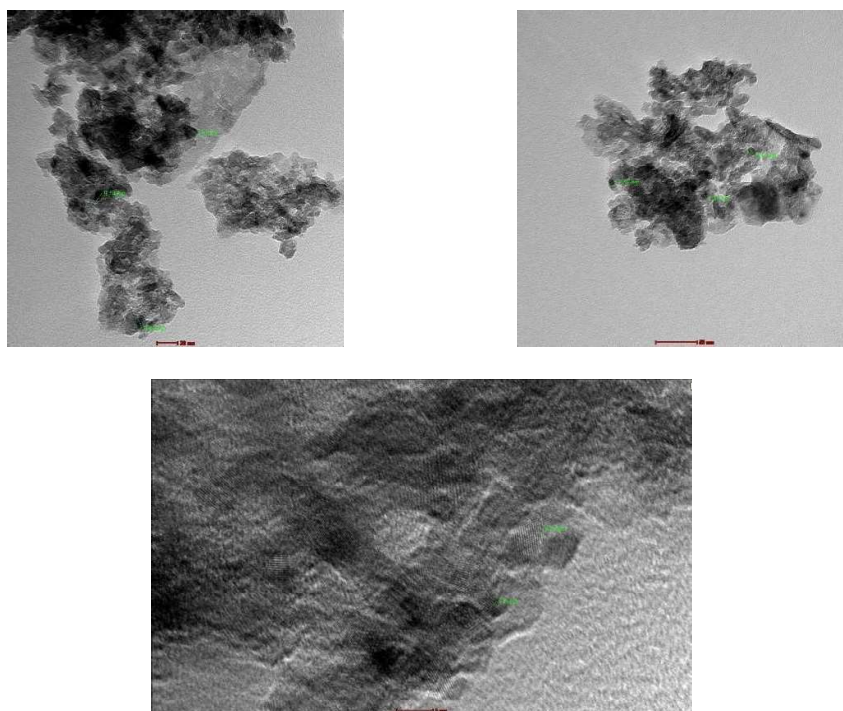


Figure A10.3: HRTEM Images of 7.5Ni-AMZ-39-49-0

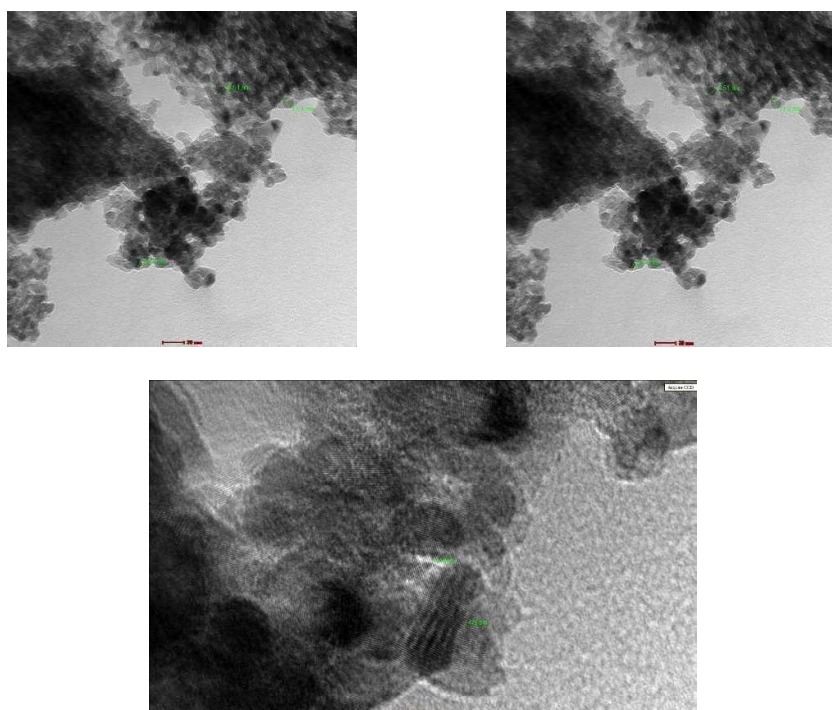


Figure A10.4: HRTEM Images of 5Ni-AMZ-44-0-44

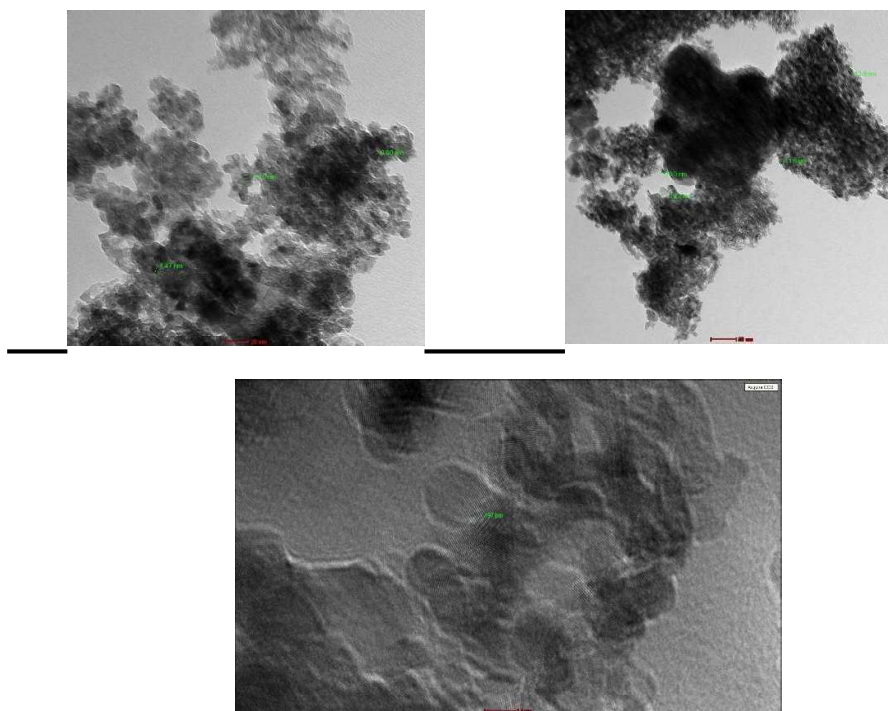


Figure A10.5: HRTEM Images of 10Ni-AMZ-44-0-44

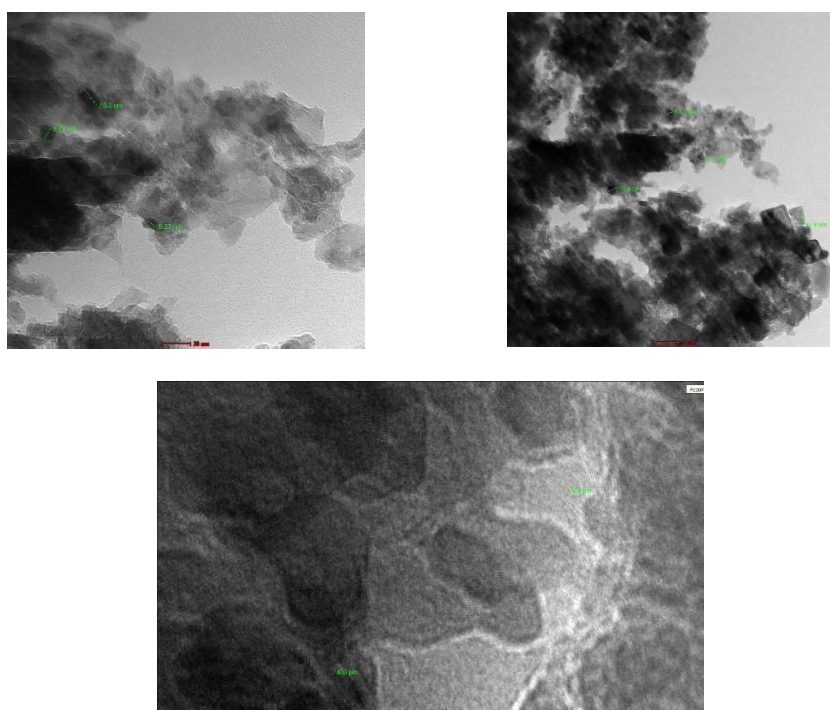


Figure A10.6: HRTEM Images of 7.5Ni-AMZ-22-44-22

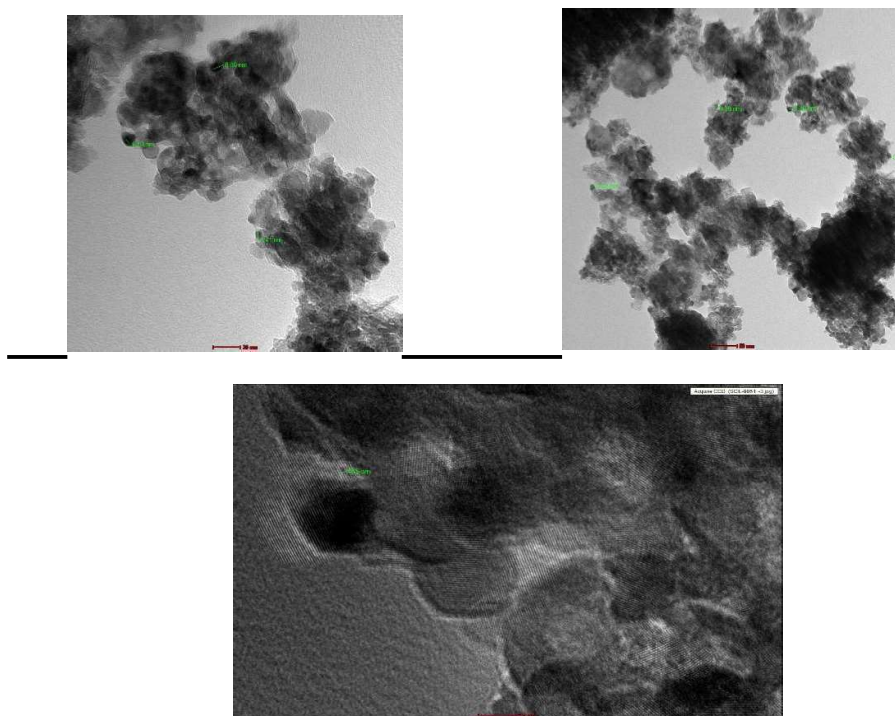


Figure A10.7: HRTEM Images of 7.5Ni-AMZ-22-22-44

Appendix 11: HRTEM micrographs of reduced catalysts

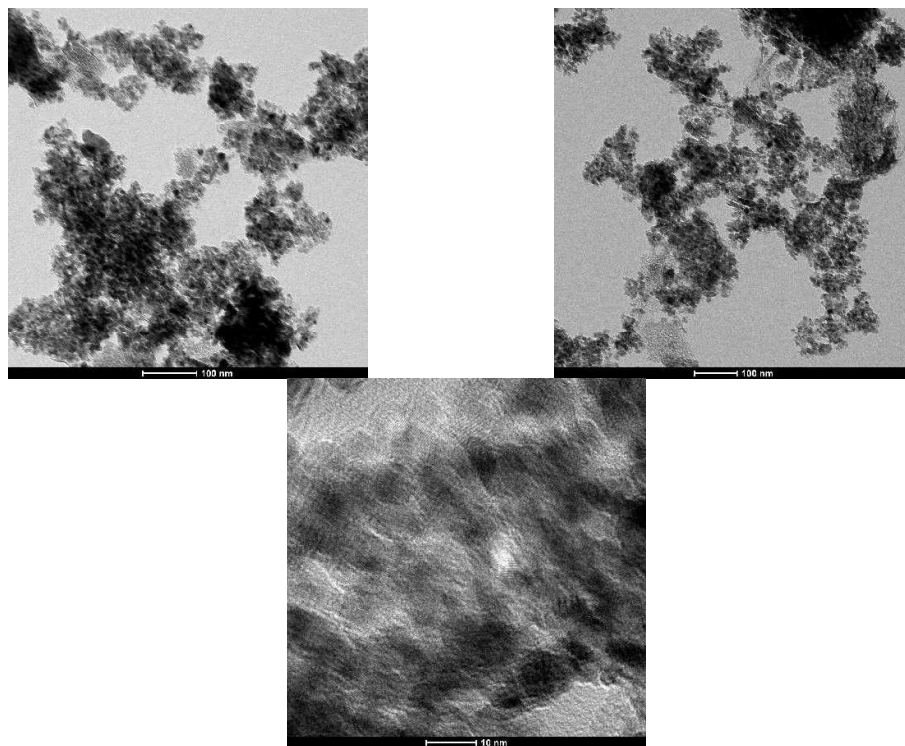


Figure A11.1: HRTEM of Reduced Catalysts 7.5Ni-AMZ-0-89-0

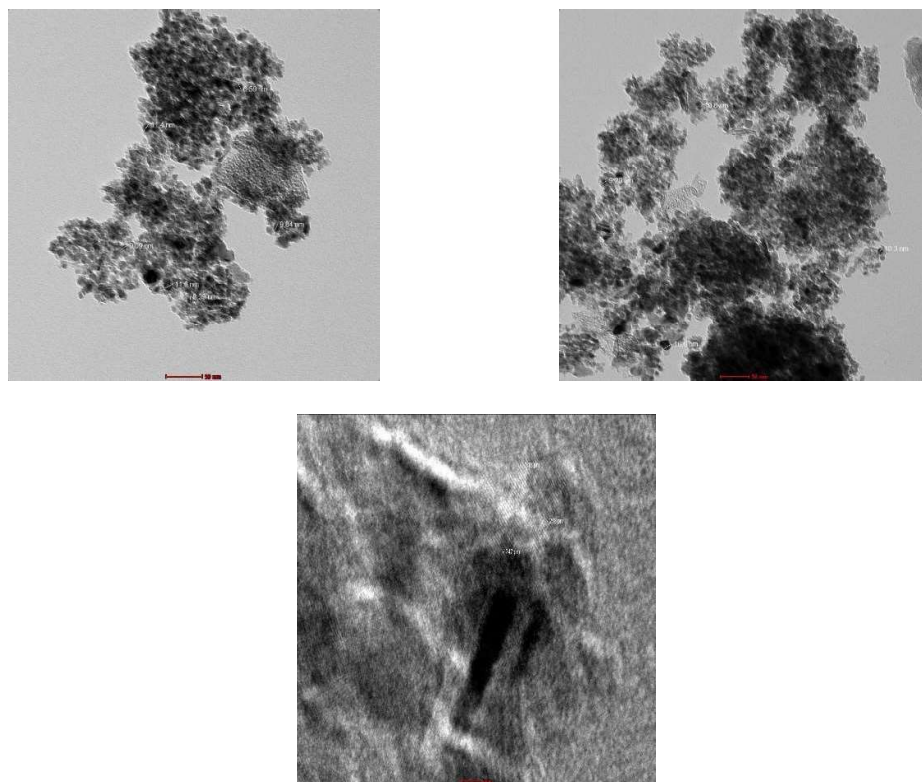


Figure A11.2: HRTEM of Reduced Catalysts 7.5Ni-AMZ-0-0-89

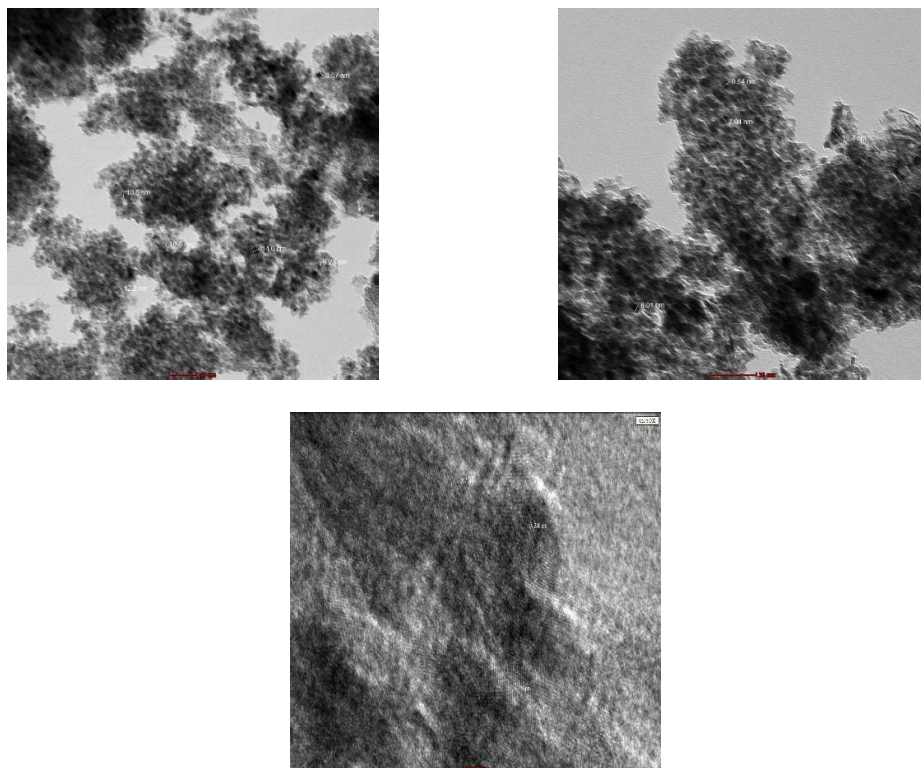


Figure A11.3: HRTEM of Reduced Catalysts 7.5Ni-AMZ-44-44-0

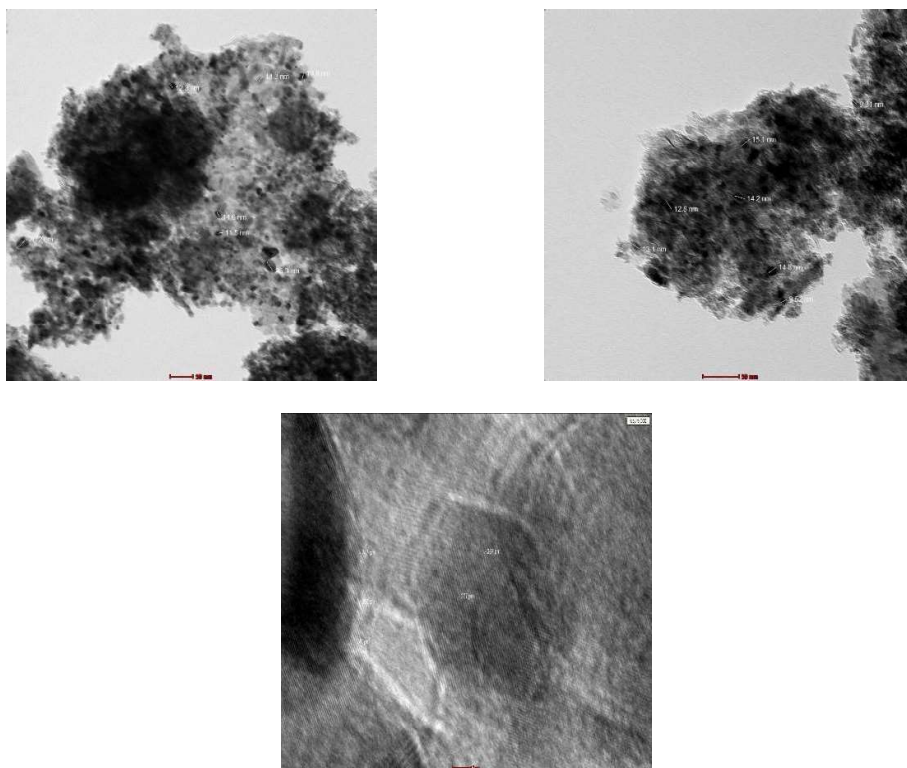


Figure A11.4: HRTEM of Reduced Catalysts 7.5Ni-AMZ-0-44-44

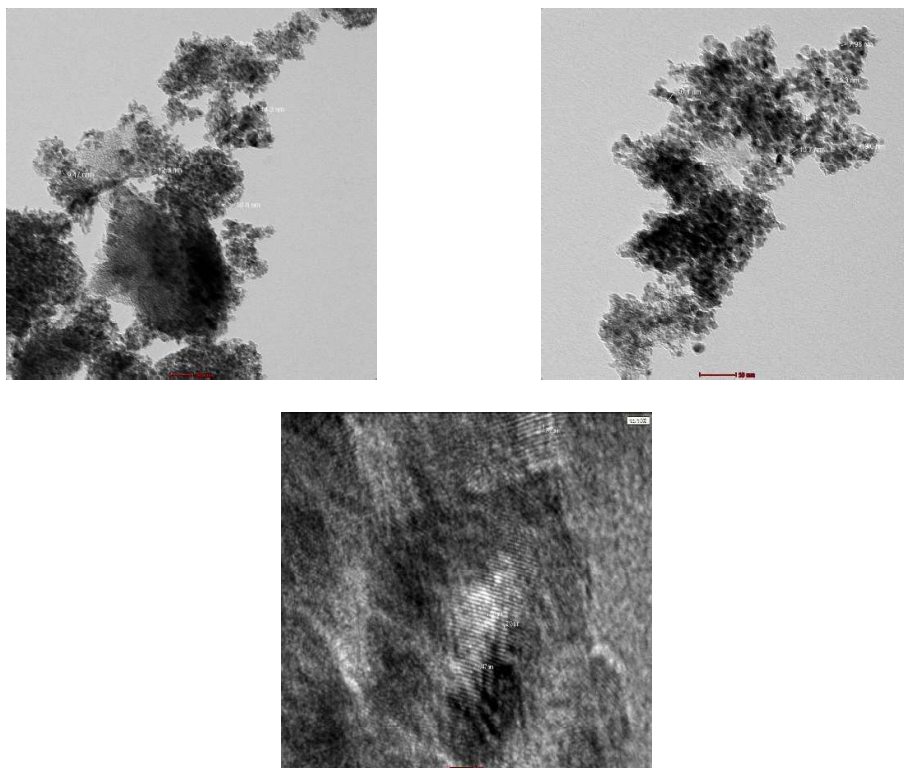


Figure A11.5: HRTEM of Reduced Catalysts 7.5Ni-AMZ-44-0-44

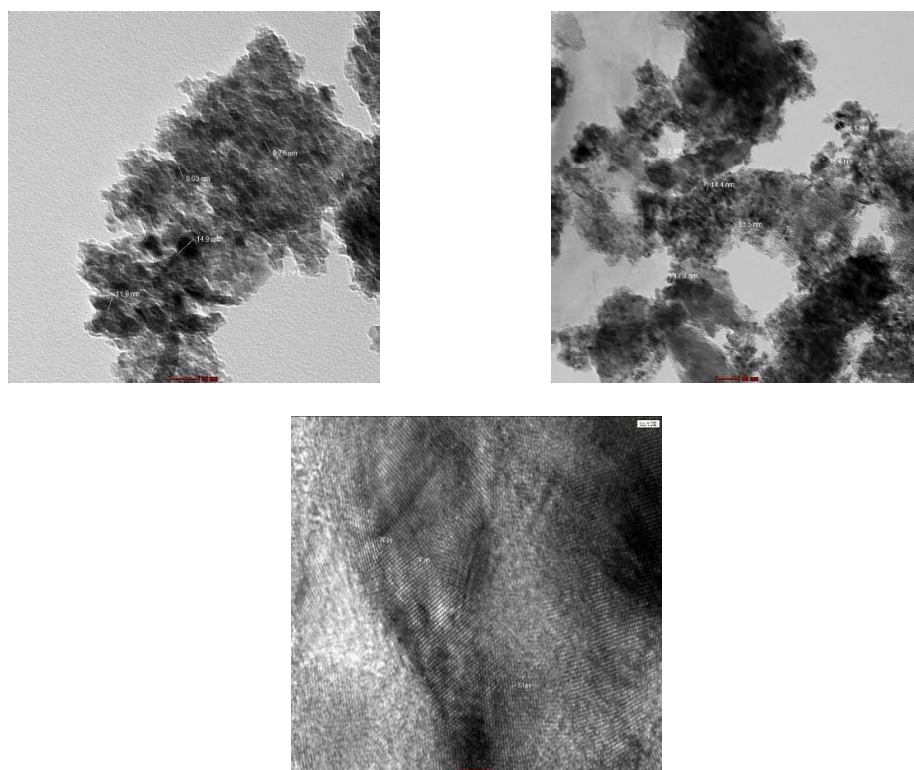


Figure A11.6: HRTEM of Reduced Catalysts 7.5Ni-AMZ-22-44-22

Appendix 12: HRTEM micrographs of spent catalysts

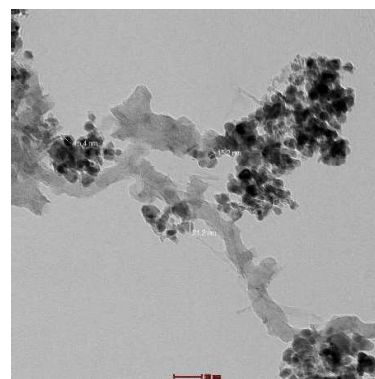
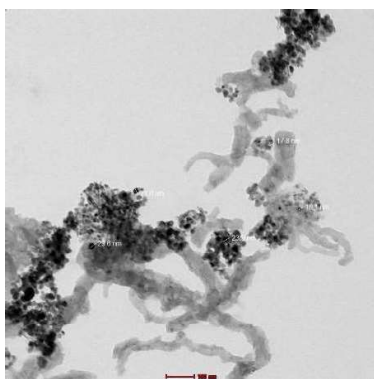


Figure A12.1: HRTEM Images of Spent 7.5Ni-AMZ-0-89-0

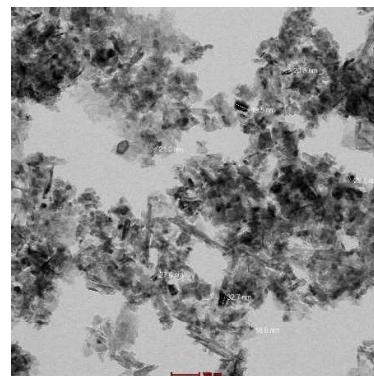
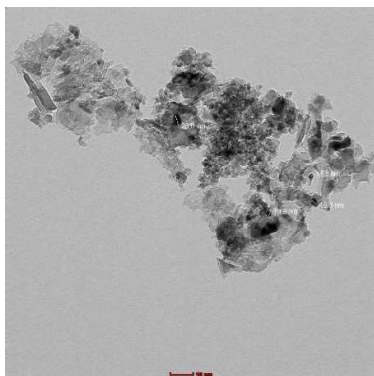


Figure A12.2: HRTEM Images of Spent 7.5Ni-AMZ-44-44-0

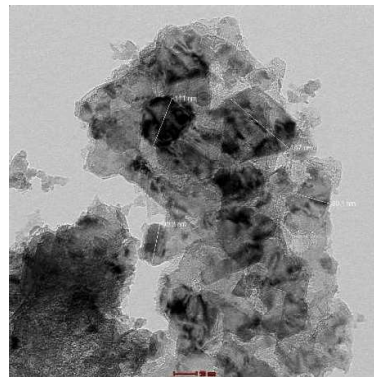
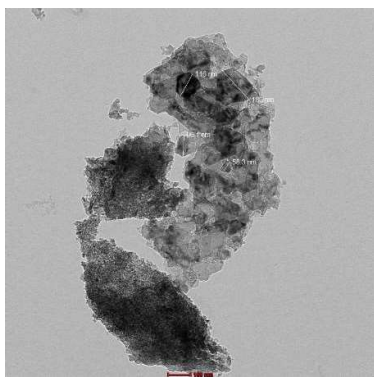


Figure A12.3: HRTEM Images of Spent 7.5Ni-AMZ-44-0-44

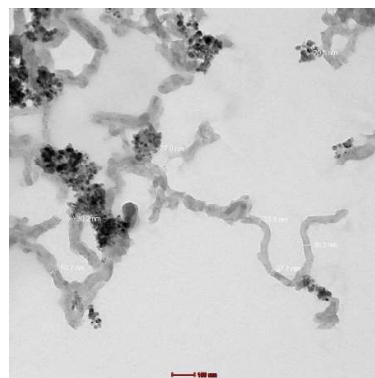
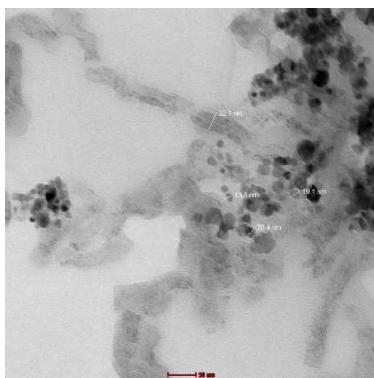


Figure A12.4: HRTEM Images of Spent 7.5Ni-AMZ-39-49-0

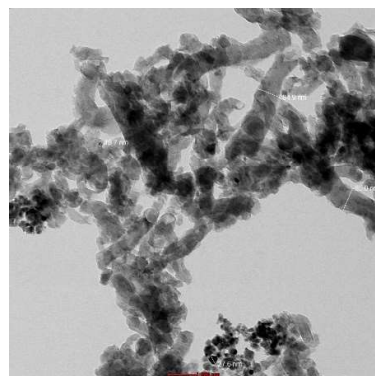
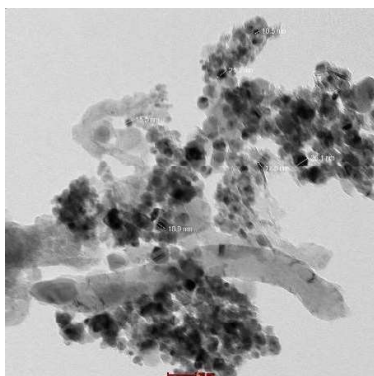


Figure A12.5: HRTEM Images of Spent 7.5Ni-AMZ-29-59-0

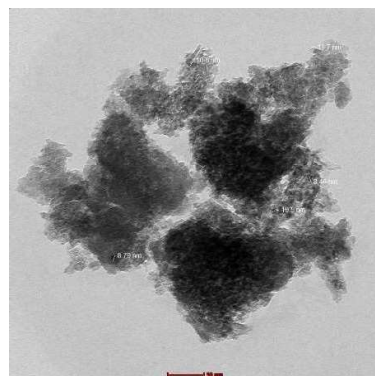
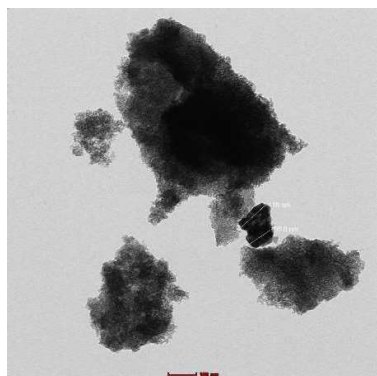


Figure A12.6: HRTEM Images of Spent 7.5Ni-AMZ-44-22-22

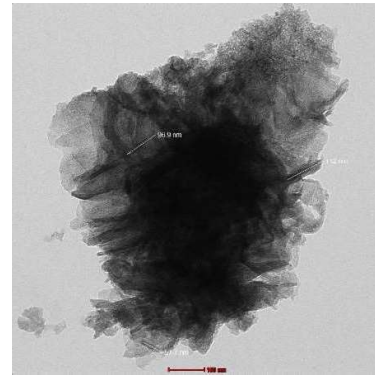
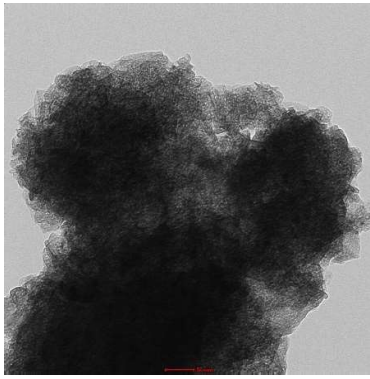


Figure A12.7: HRTEM Images of Spent 7.5Ni-AMZ-22-44-22

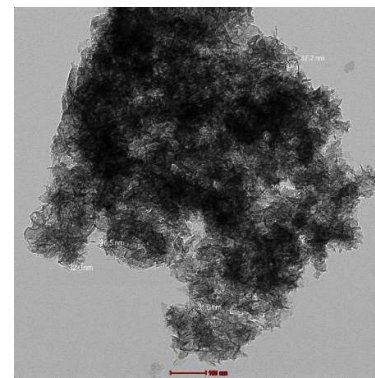
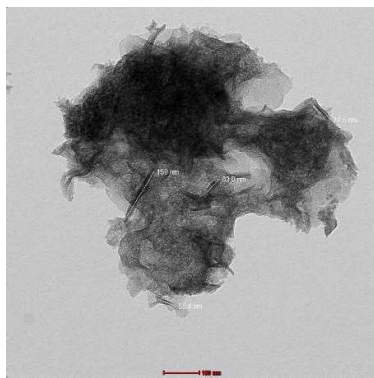


Figure A12.8: HRTEM Images of Spent 7.5Ni-AMZ-22-22-44