APPENDIX A1

(a)

(b)

(c)

Figure A1 Photographs of (a) experimental set-up (b) reactor and (c) catalyst bed.

APPENDIX A2

(i)

(ii)

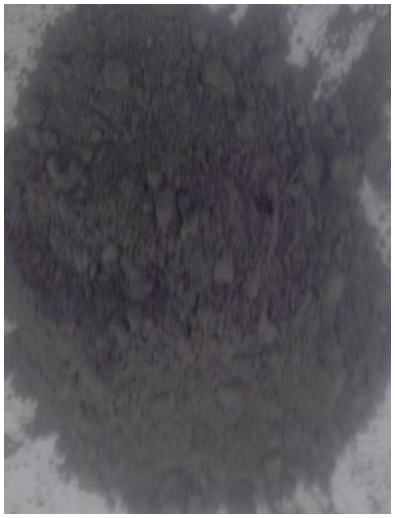
Figure A2.1a Photographs of (i) pyrolysis oil and (ii) solid residue obtained by thermal pyrolysis of polyethylene.

(i)

(ii)

Figure A2.1b Photographs of (i) pyrolysis oil and (ii) solid residue obtained by thermal pyrolysis of polypropylene.

(i)



(ii)

Figure A2.1c Photographs of (i) pyrolysis oil and (ii) solid residue obtained by thermal pyrolysis of polystyrene.

APPENDIX A3

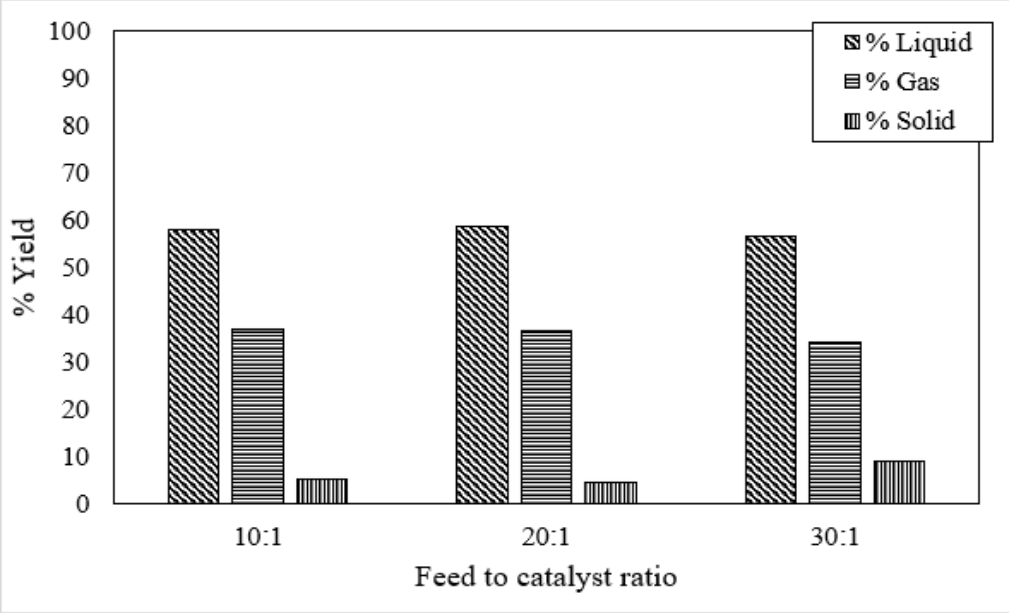


Figure A3.1a Comparison of liquid yield, gaseous yield and solid residue at 700 ^{o}C for B-type (Liquid phase) arrangement using ZSM-5 for 50 g of polyethylene.

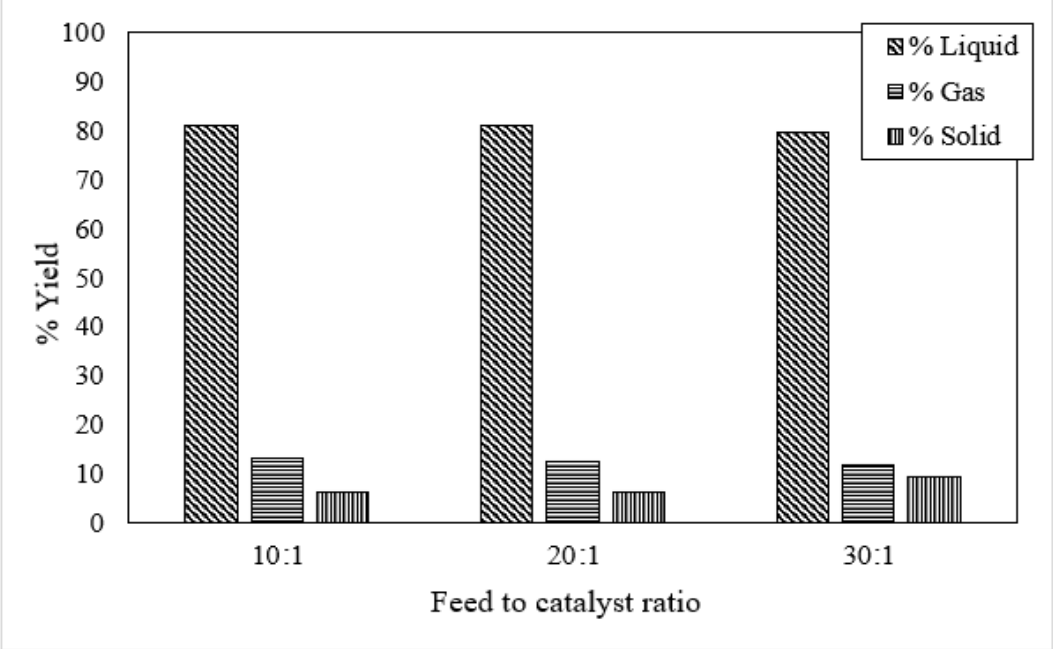


Figure A3.1b Comparison of liquid yield, gaseous yield and solid residue at 700 ^{o}C for B-type (Liquid phase) arrangement using ZSM-5 for 50 g of polypropylene.

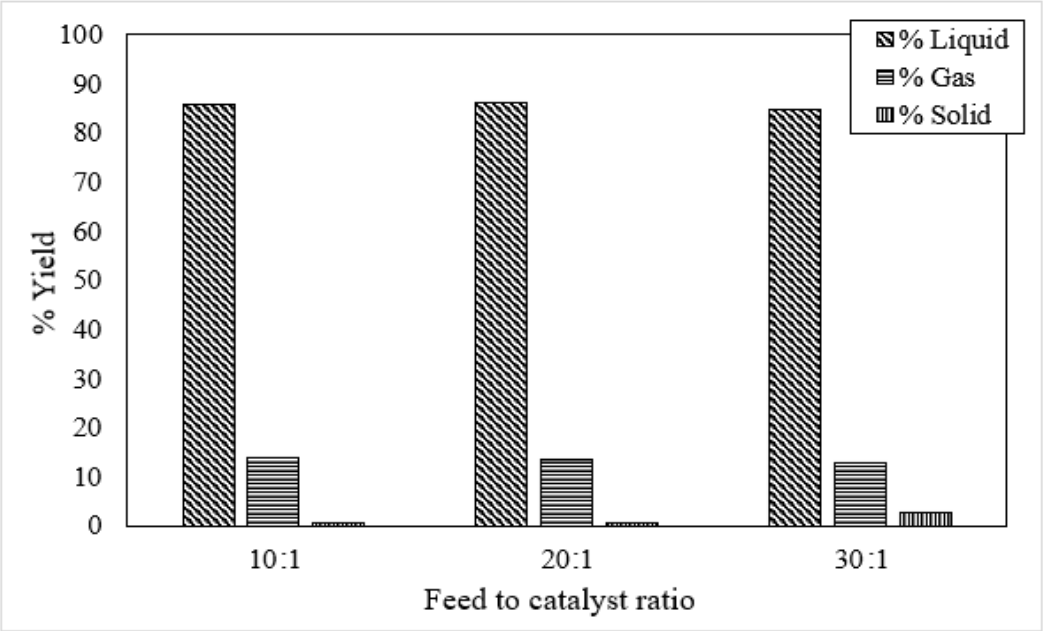


Figure A3.1c Comparison of liquid yield, gaseous yield and solid residue at 700 ºC for B-type (liquid phase) arrangement using ZSM-5 for 50 g of polystyrene.

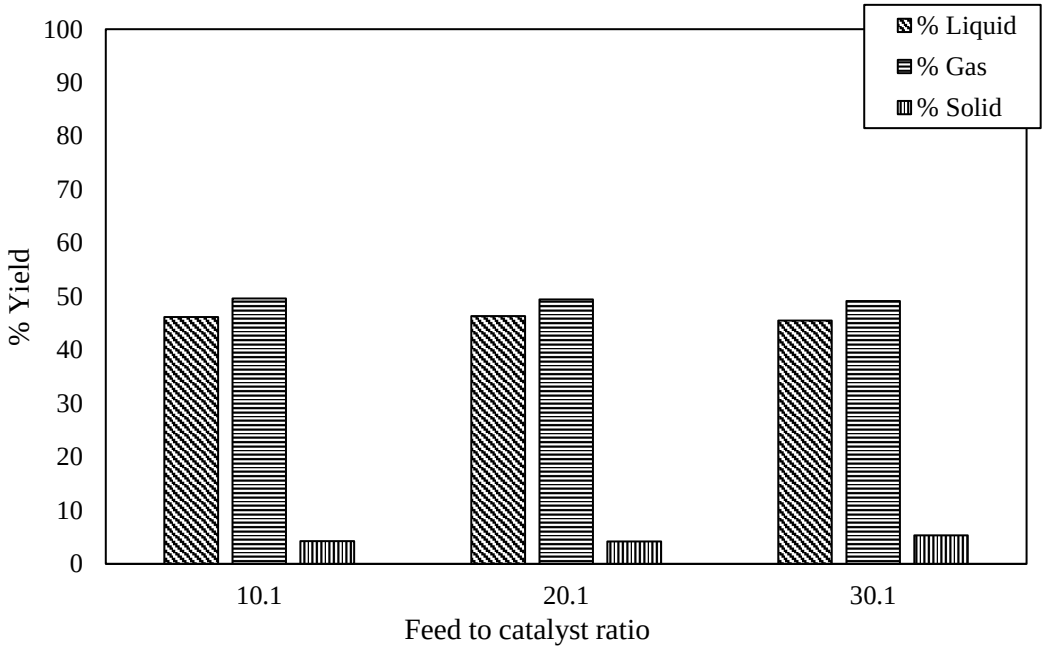


Figure A3.2a Comparison of liquid yield, gaseous yield and solid residue at 700 ºC for C-type (multiphase) arrangement using ZSM-5 for 50 g of polyethylene.

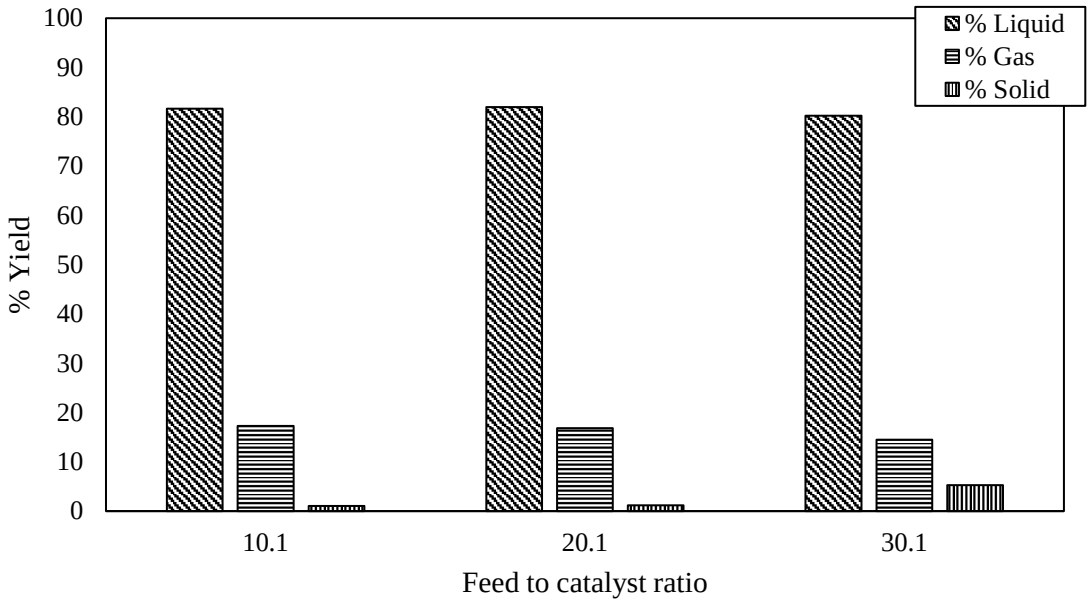


Figure A3.2b Comparison of liquid yield, gaseous yield and solid residue at 700 ^{o}C for C-type (multiphase) arrangement using ZSM-5 for 50 g of polypropylene.

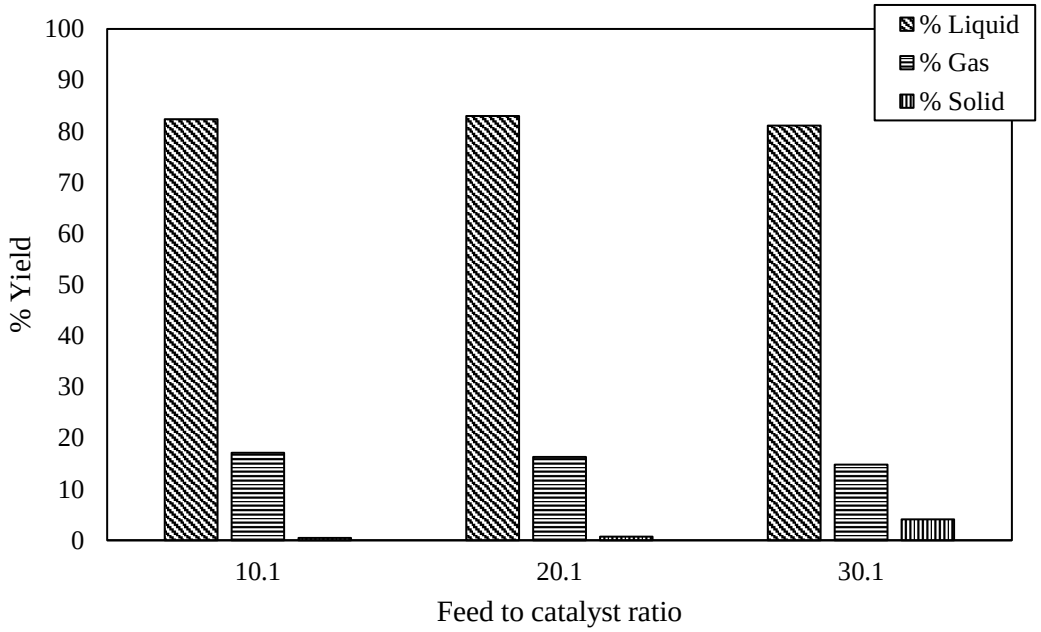


Figure A3.2c Comparison of liquid yield, gaseous yield and solid residue at 700 ^{o}C for C-type (multiphase) arrangement using ZSM-5 for 50 g of polystyrene.

APPENDIX A4

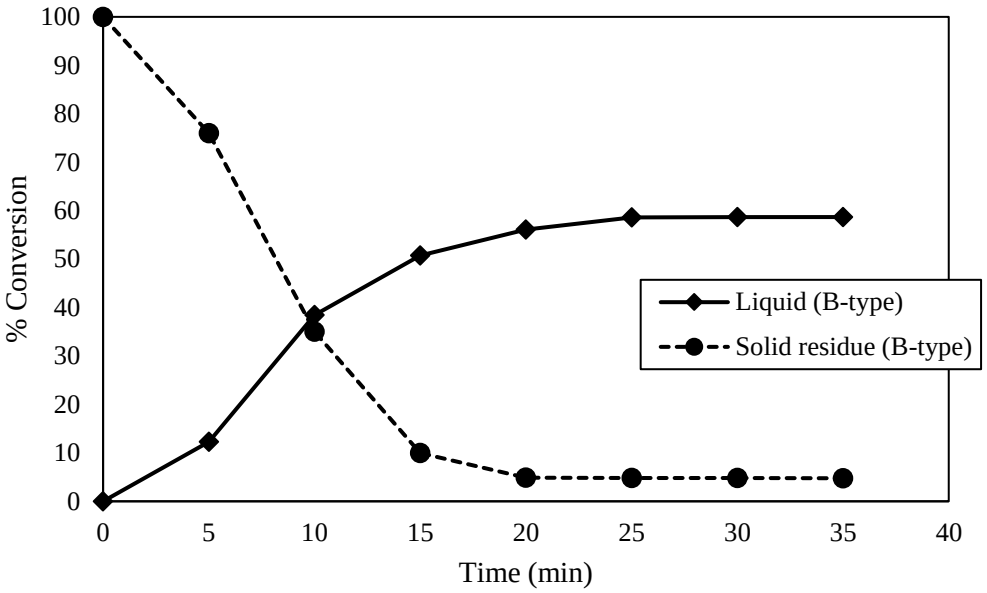


Figure A4.1a Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polyethylene using ZSM-5 catalyst at the temperature of 700 °C in B-type reactor arrangement (Liquid phase).

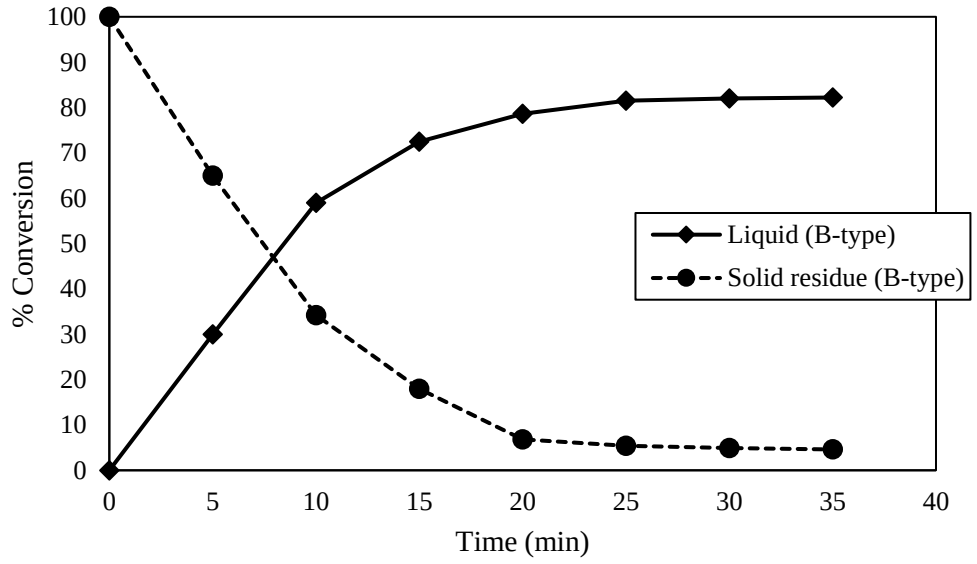


Figure A4.1b Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polypropylene using ZSM-5 catalyst at the temperature of 700 °C in B-type reactor arrangement (Liquid phase).

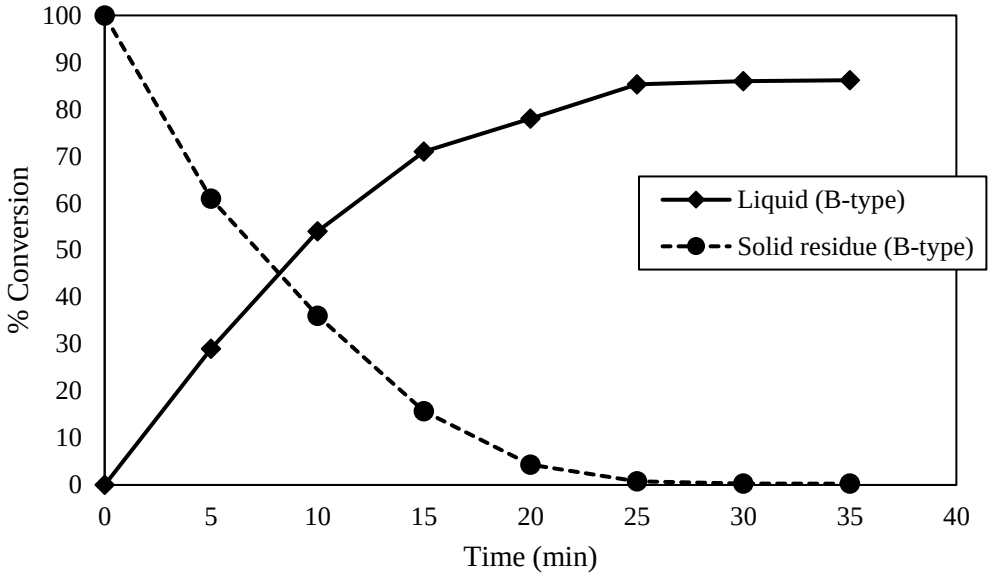


Figure A4.1c Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polystyrene using ZSM-5 catalyst at the temperature of 700 °C in B-type reactor arrangement (Liquid phase).

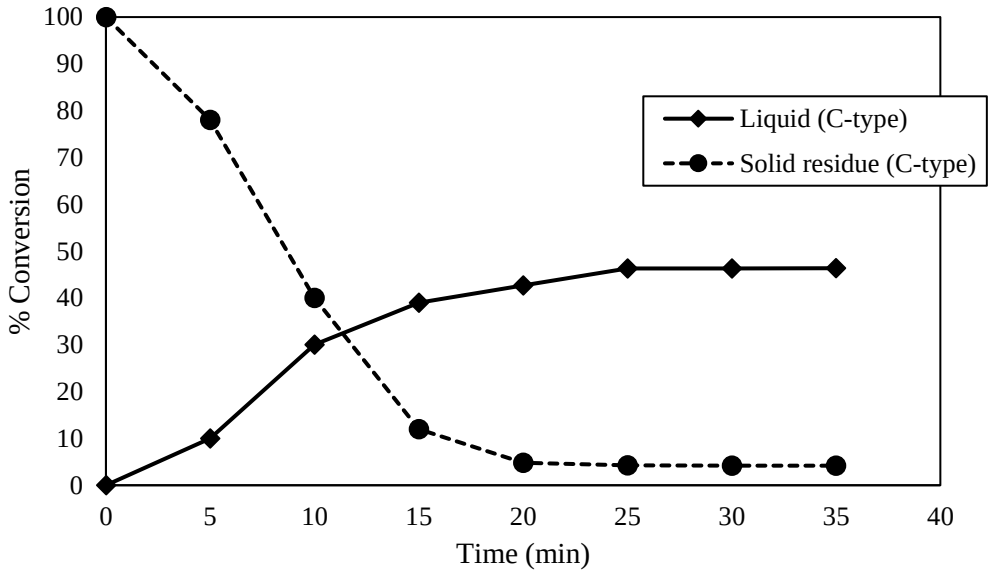


Figure A4.2a Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polyethylene using ZSM-5 catalyst at the temperature of 700 °C in C-type reactor arrangement (Vapor and liquid phase).

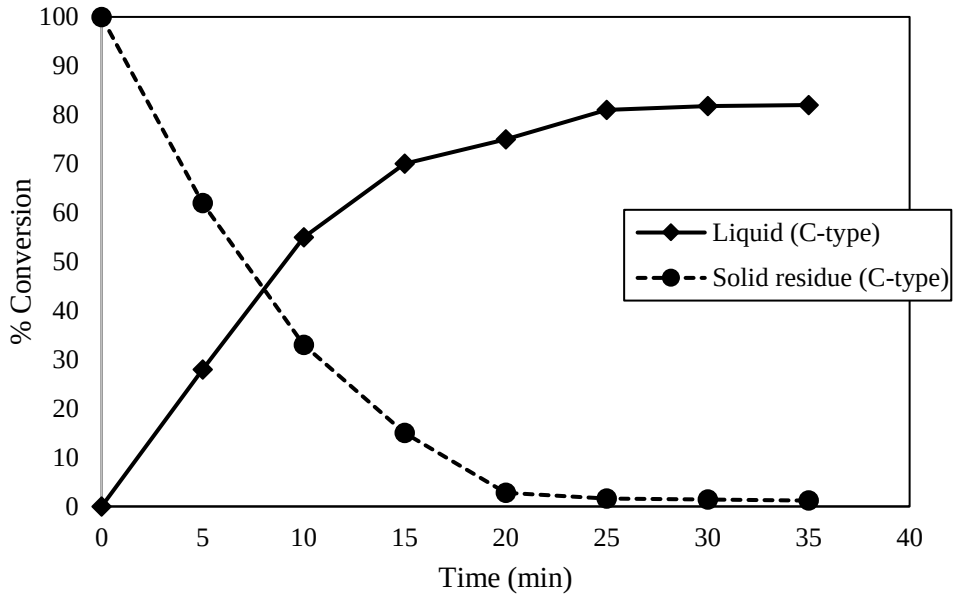


Figure A4.2b Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polypropylene using ZSM-5 catalyst at the temperature of 700 °C in C-type reactor arrangement (Vapor and liquid phase).

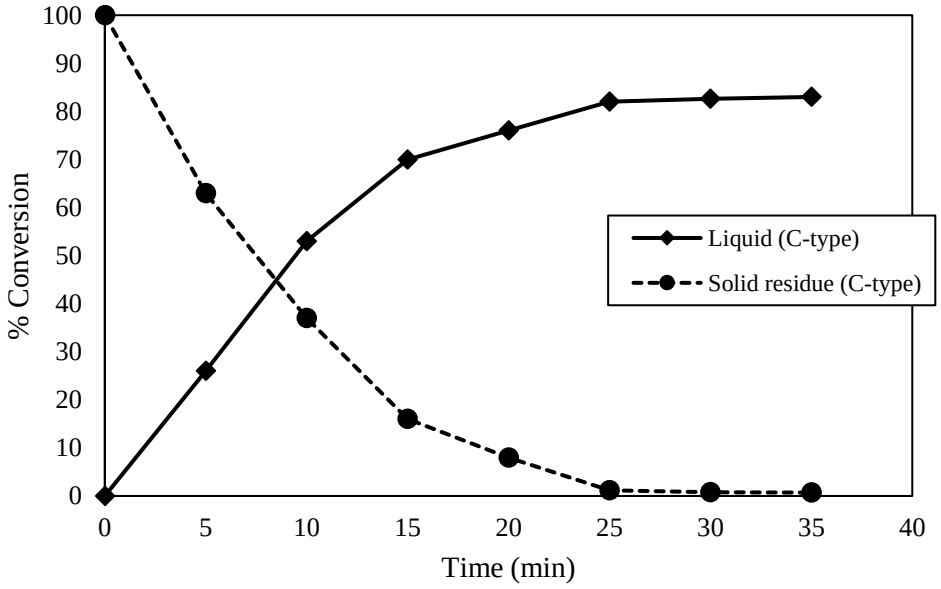


Figure A4.2c Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polystyrene using ZSM-5 catalyst at the temperature of 700 °C in C-type reactor arrangement (Vapor and liquid phase).

APPENDIX A5

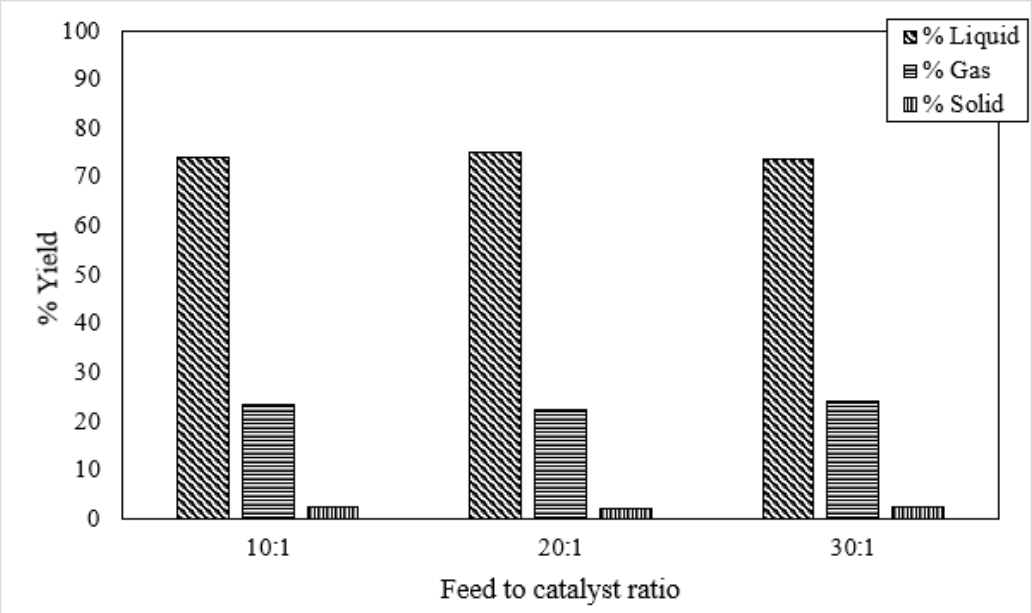


Figure A5.1a Comparison of liquid yield, gaseous yield and solid residue at 700 ºC for B-type (Liquid phase) arrangement using FA-800 for 50 g of polyethylene.

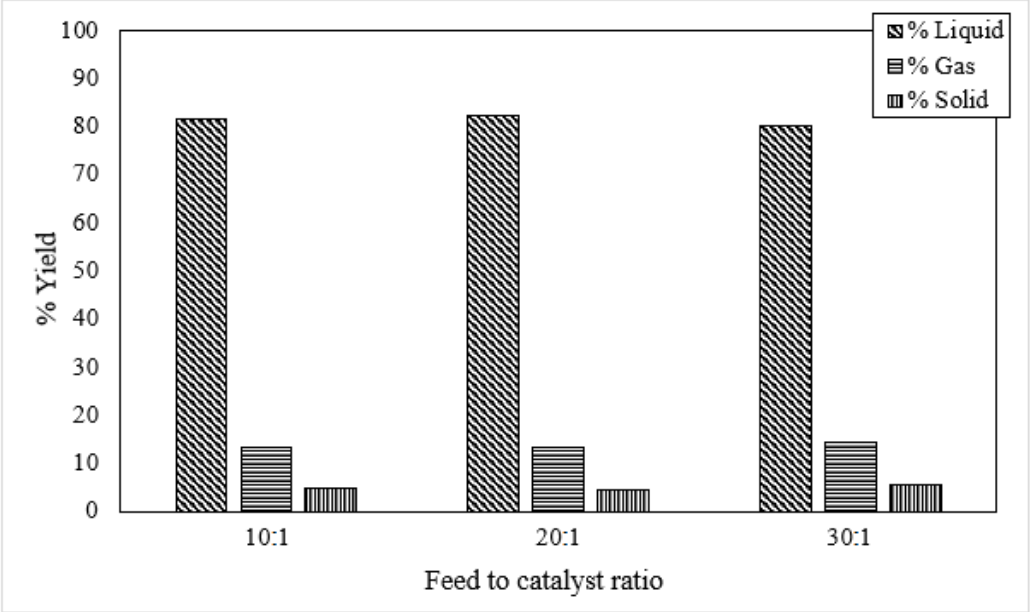


Figure A5.1b Comparison of liquid yield, gaseous yield and solid residue at 700 ºC for B-type (Liquid phase) arrangement using FA-800 for 50 g of polypropylene.

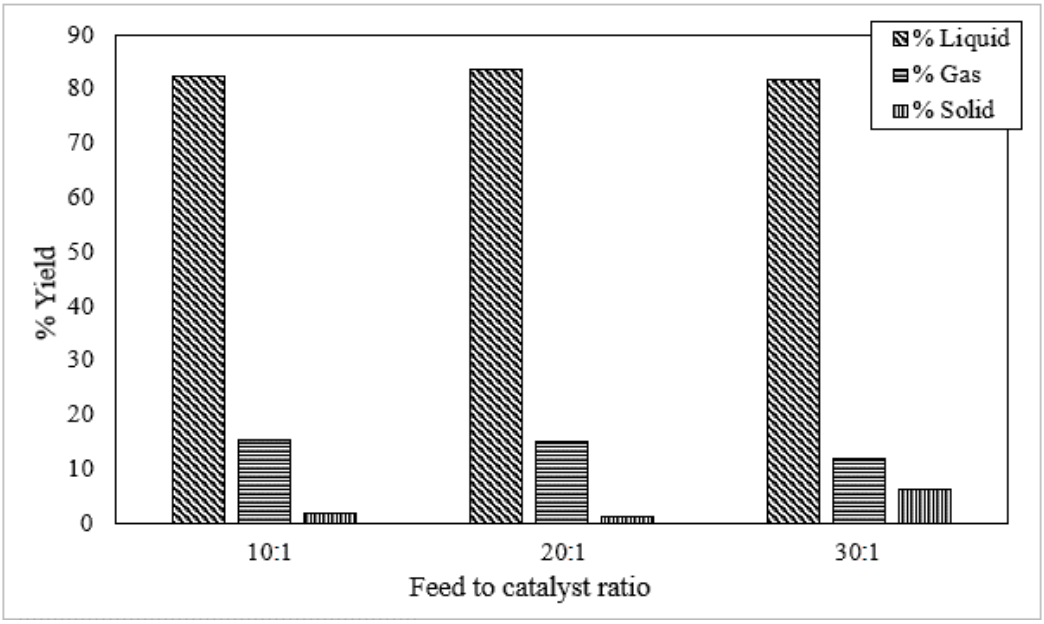


Figure A5.1c Comparison of liquid yield, gaseous yield and solid residue at 700 ^{o}C for B-type (Liquid phase) arrangement using FA-800 for 50 g of polystyrene.

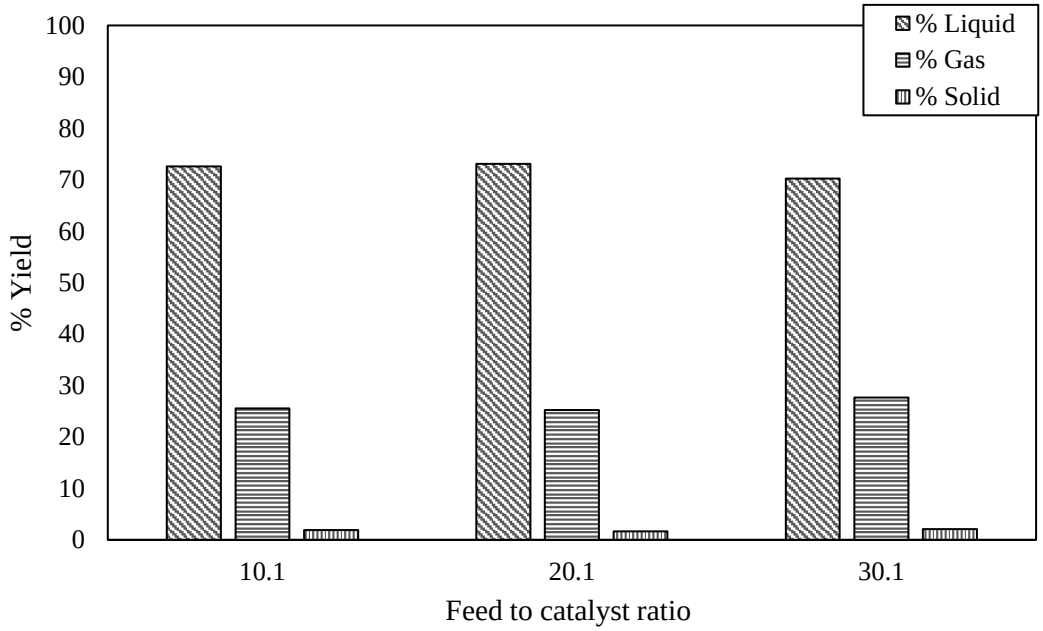


Figure A5.2a Comparison of liquid yield, gaseous yield and solid residue at 700 ^{o}C for C-type (Vapor and liquid phase) arrangement using FA-800 for 50 g of polyethylene.

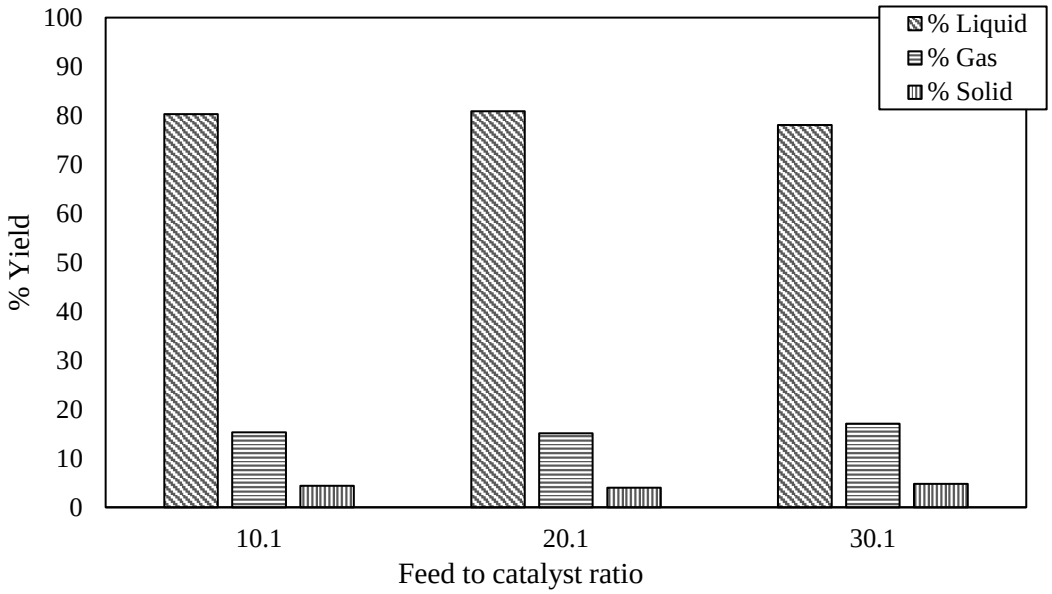


Figure A5.2b Comparison of liquid yield, gaseous yield and solid residue at 700 ºC for C-type (Vapor and liquid phase) arrangement using FA-800 for 50 g of polypropylene.

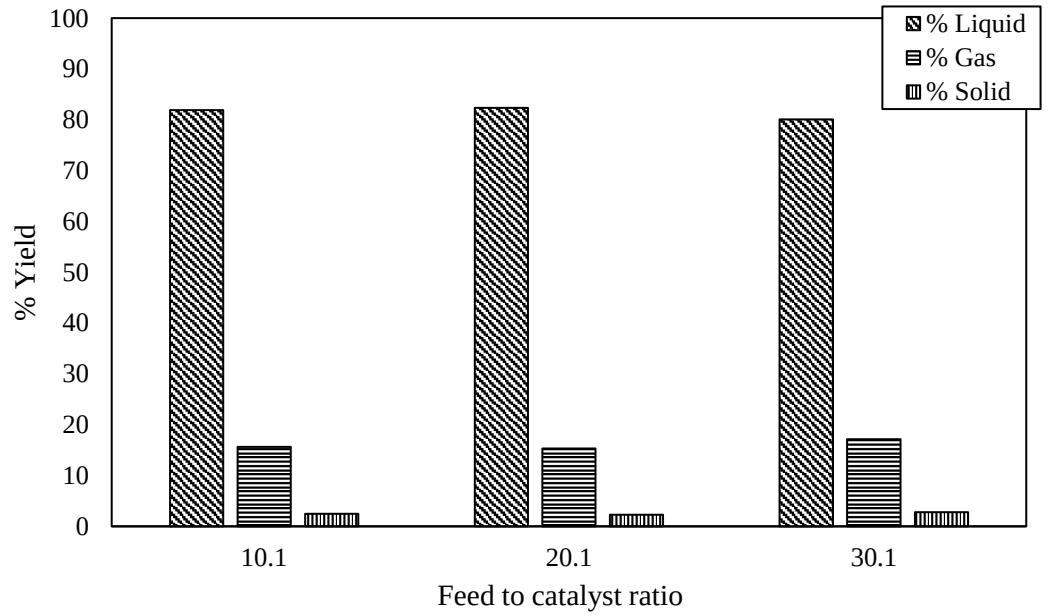


Figure A5.2c Comparison of liquid yield, gaseous yield and solid residue at 700 ºC for C-type (Vapor and liquid phase) arrangement using FA-800 for 50 g of polystyrene.

APPENDIX A6

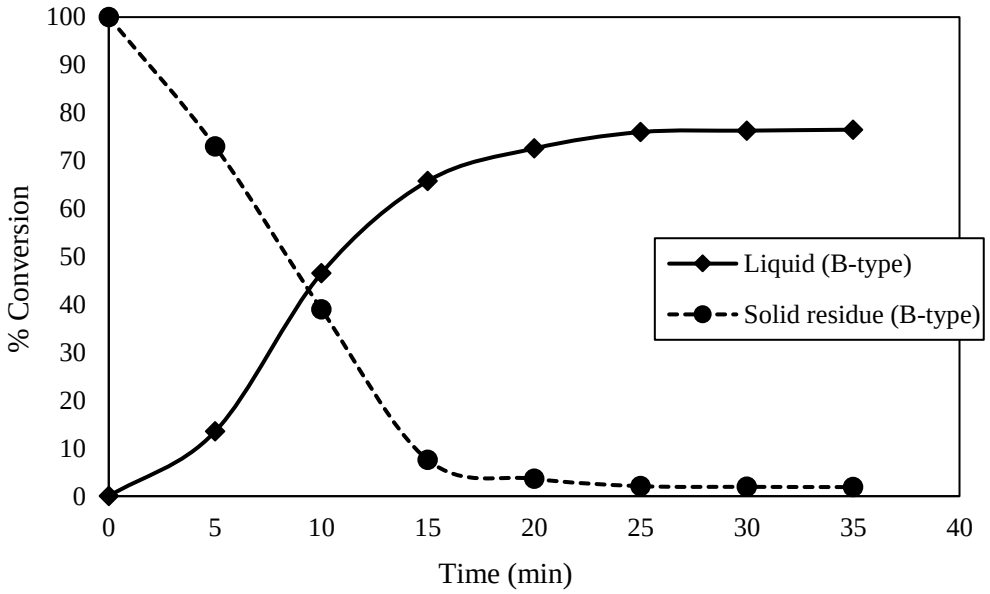


Figure A6.1a Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polyethylene using FA-800 catalyst at the temperature of 700 °C in B-type reactor arrangement (liquid phase).

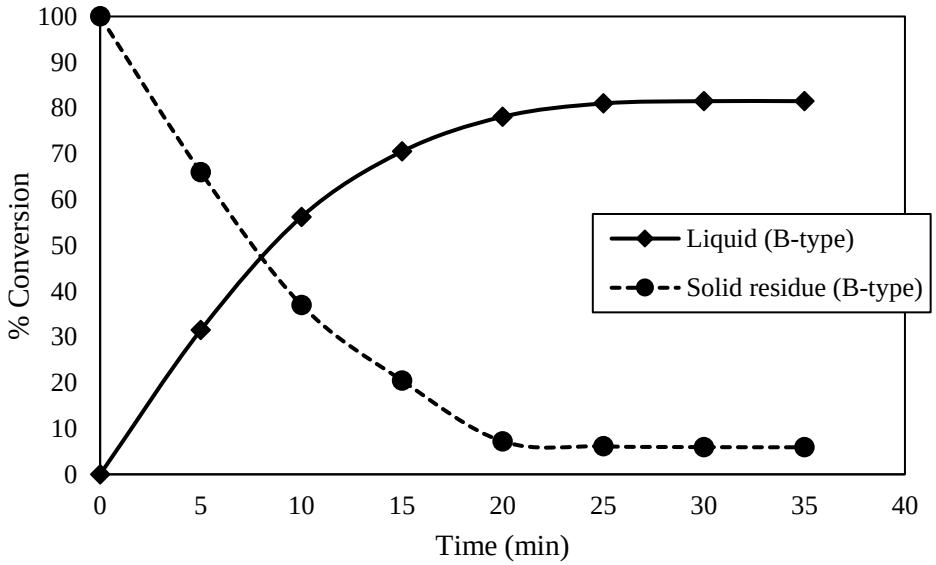


Figure A6.1b Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polypropylene using FA-800 catalyst at the temperature of 700 °C in B-type reactor arrangement (liquid phase).

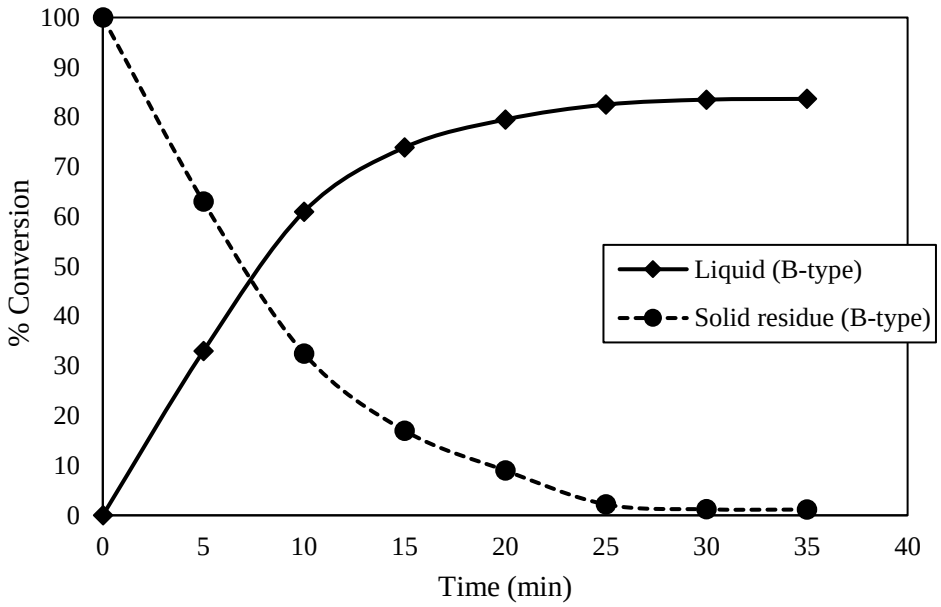


Figure A6.1c Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polystyrene using FA-800 catalyst at the temperature of 700 °C in B-type reactor arrangement (liquid phase).

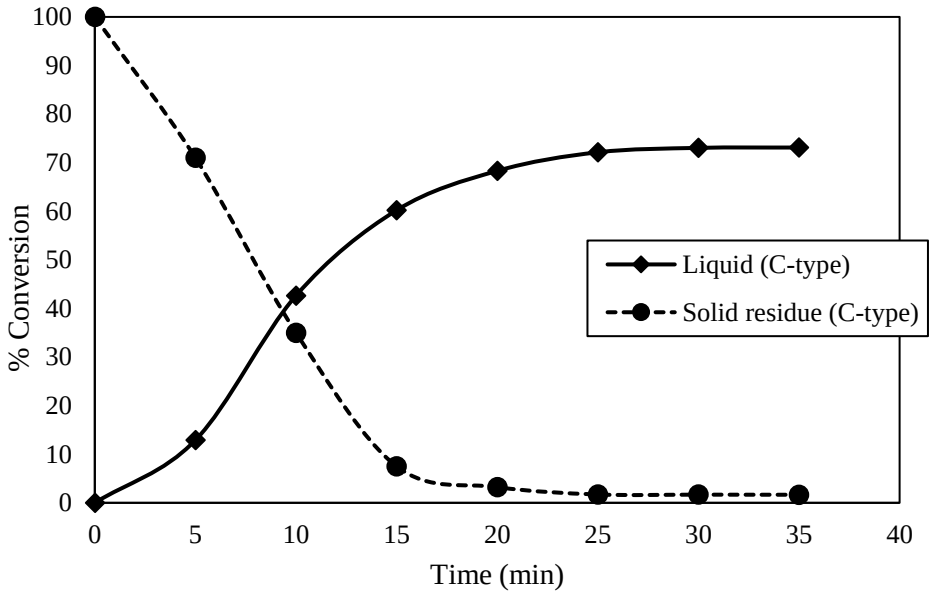


Figure A6.2a Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polyethylene using FA-800 catalyst at the temperature of 700 °C in C-type reactor arrangement (liquid and vapor phase).

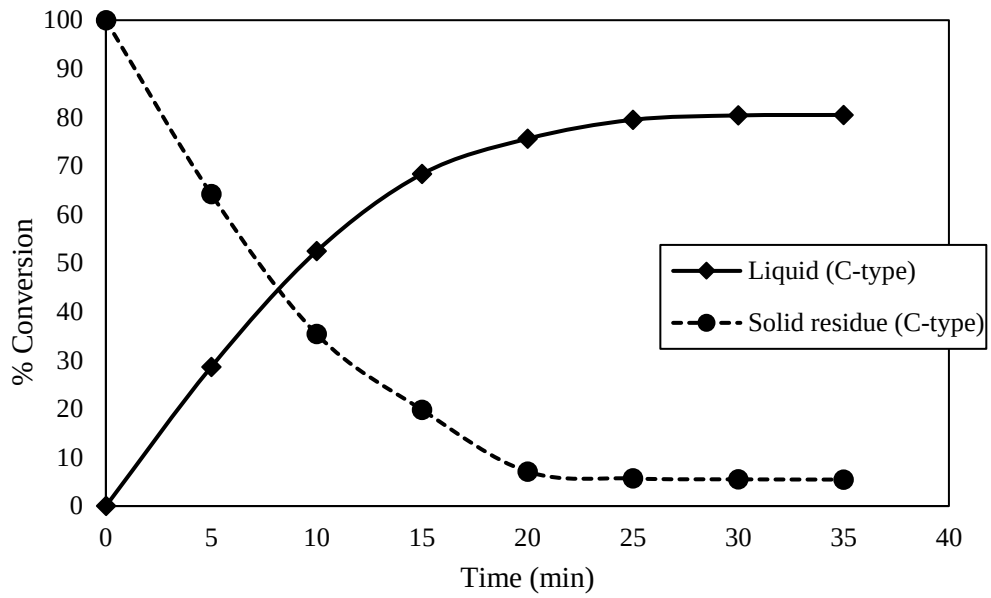


Figure A6.2b Time vs. percentage conversion of liquid and solid residue for catalytic pyrolysis of polypropylene using FA-800 catalyst at the temperature of 700 °C in C-type reactor arrangement (liquid and vapor phase).

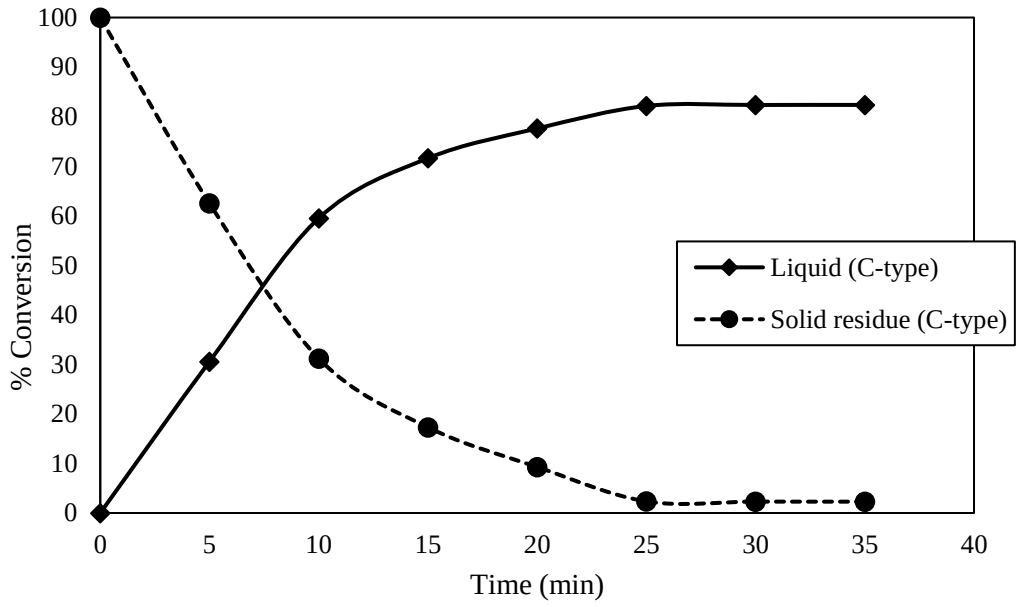


Figure A6.2c Time vs. conversion rate of liquid and solid residue for catalytic pyrolysis of polystyrene using FA-800 catalyst at the temperature of 700 °C in C-type reactor arrangement (liquid and vapor phase).

APPENDIX A7

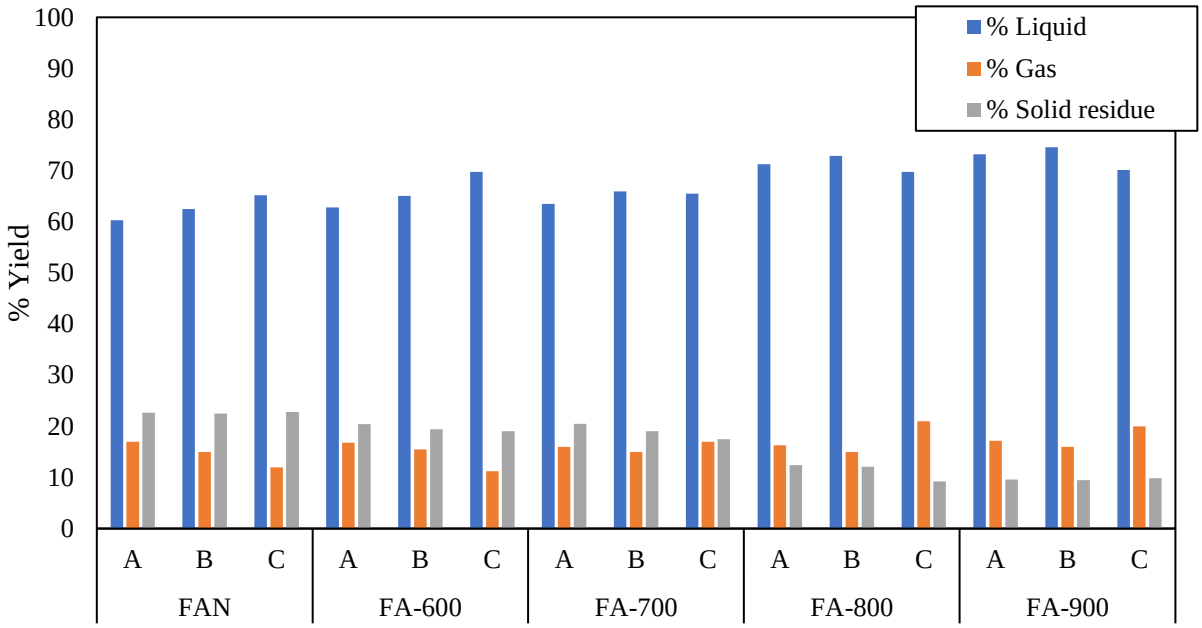


Figure A7.1a Product yield obtained from catalytic pyrolysis of polyethylene using A-type, B-type and C-type reactor arrangements at the temperature of 500 ºC.

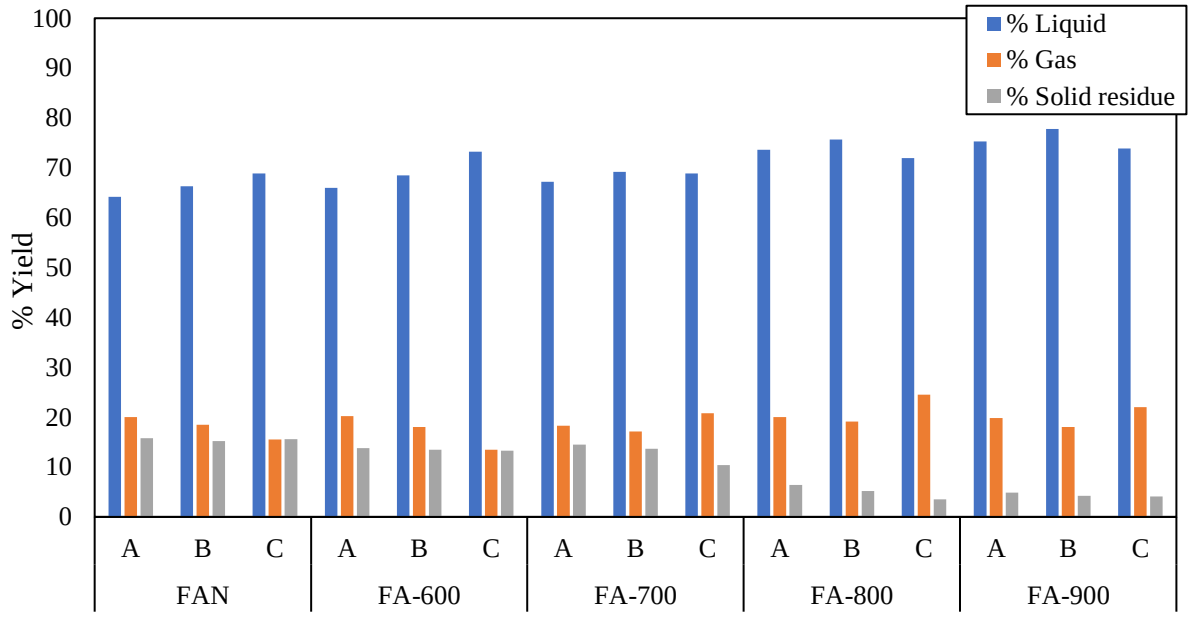


Figure A7.1b Product yield obtained from catalytic pyrolysis of polyethylene using A-type, B-type and C-type reactor arrangements at the temperature of 600 ºC.

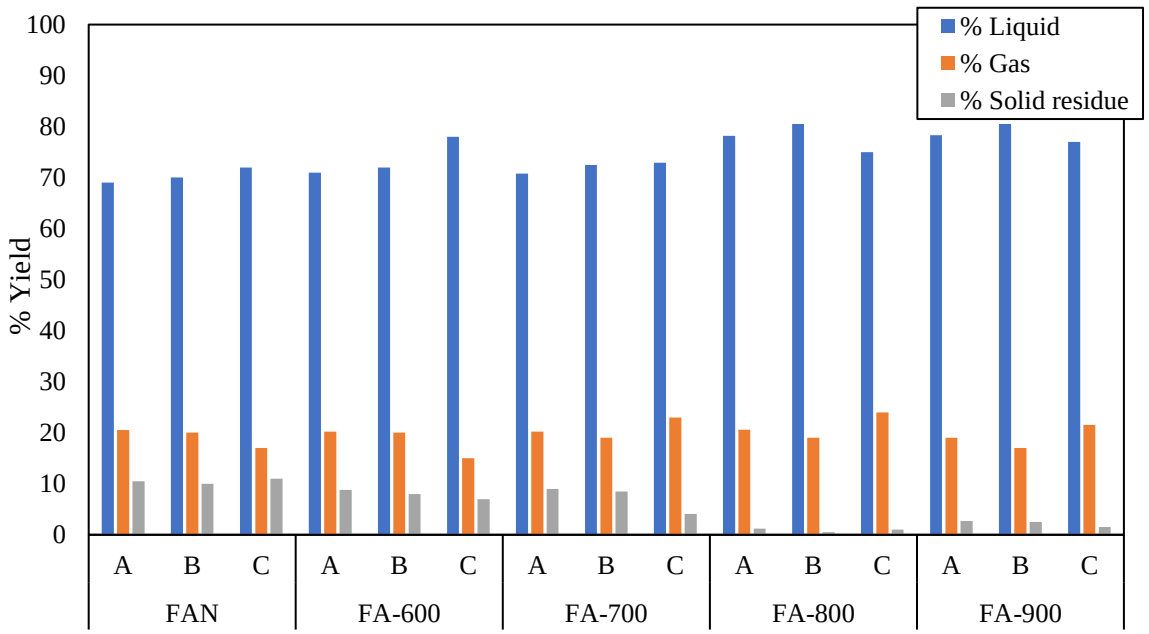


Figure A7.1c Product yield obtained from catalytic pyrolysis of polyethylene using A-type, B-type and C-type reactor arrangements at the temperature of 800 ^{o}C.

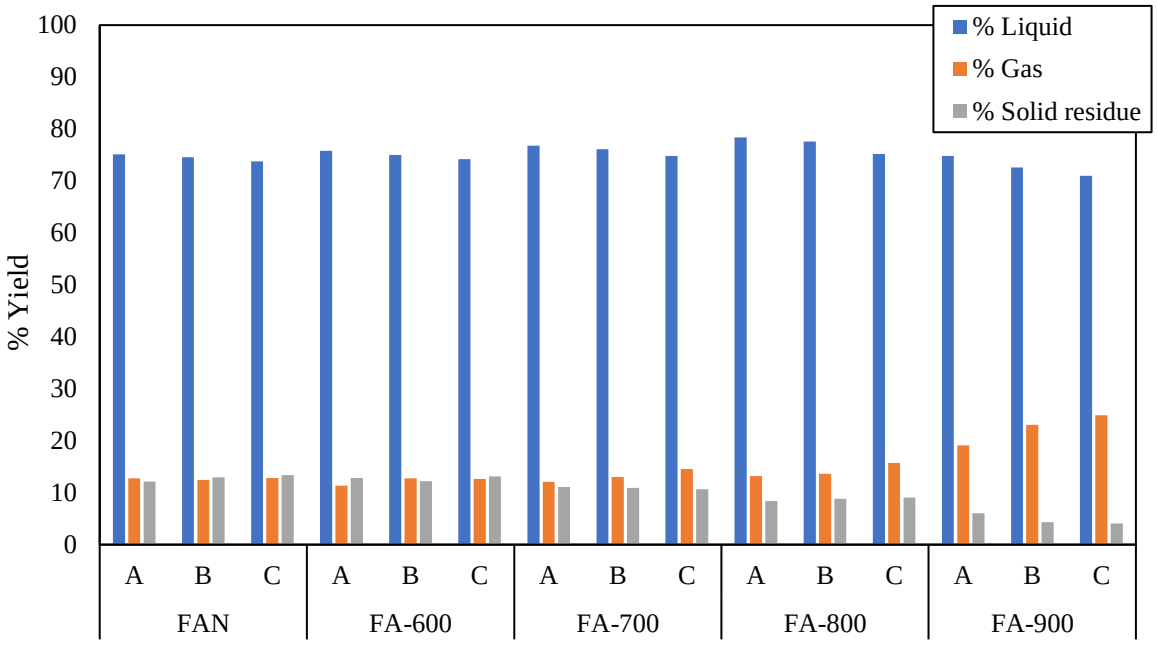


Figure A7.2a Product yield obtained from catalytic pyrolysis of polypropylene using A-type, B-type and C-type reactor arrangements at the temperature of 500 ^{o}C.

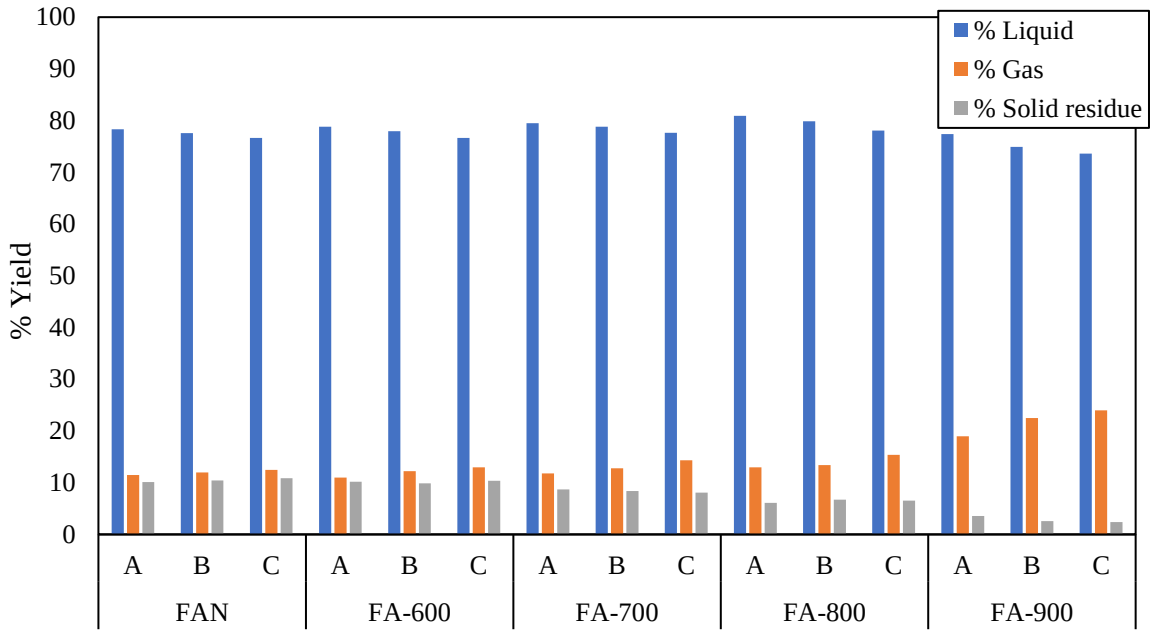


Figure A7.2b Product yield obtained from catalytic pyrolysis of polypropylene using A-type, B-type and C-type reactor arrangements at the temperature of 600 ºC.

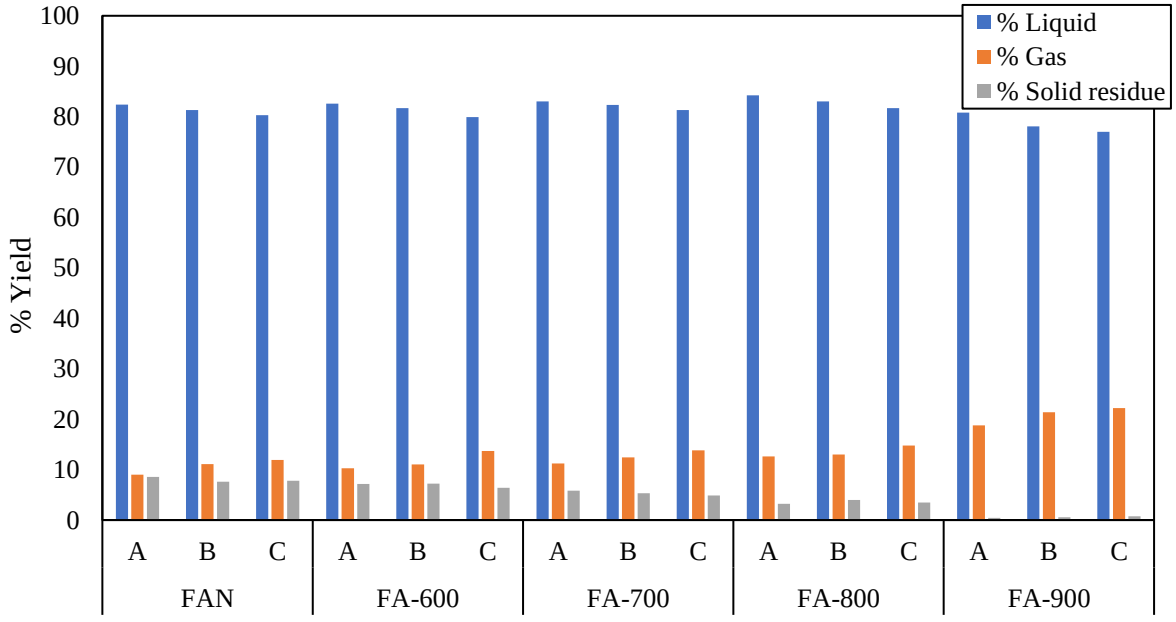


Figure A7.2c Product yield obtained from catalytic pyrolysis of polypropylene using A-type, B-type and C-type reactor arrangements at the temperature of 800 ºC.

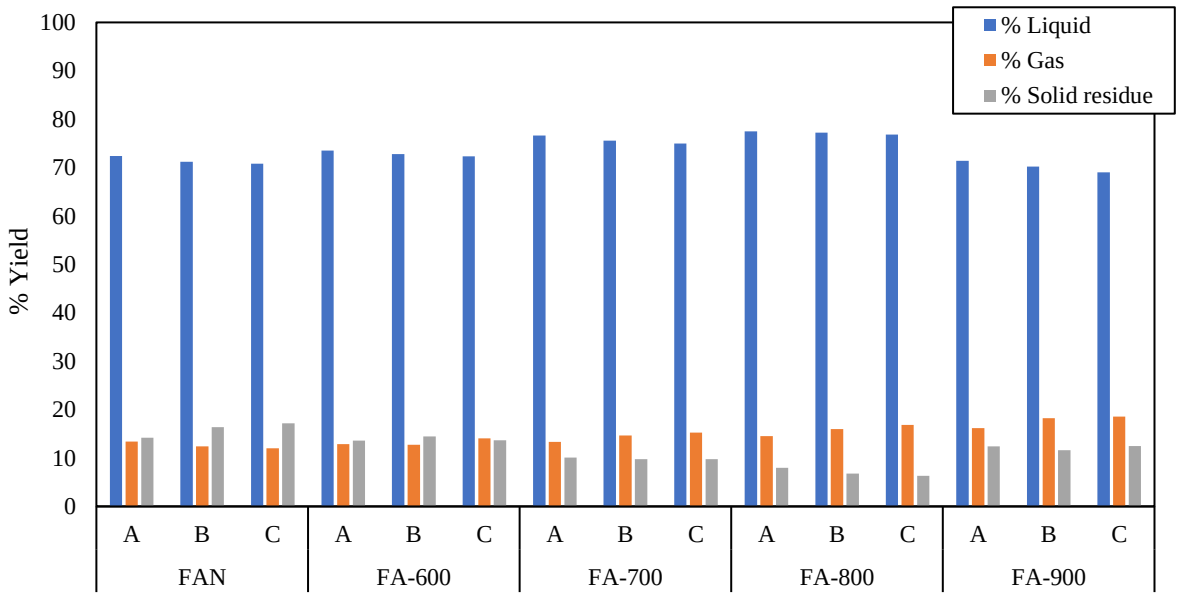


Figure A7.3a Product yield obtained from catalytic pyrolysis of polystyrene using A-type, B-type and C-type reactor arrangements at the temperature of 500 ºC.

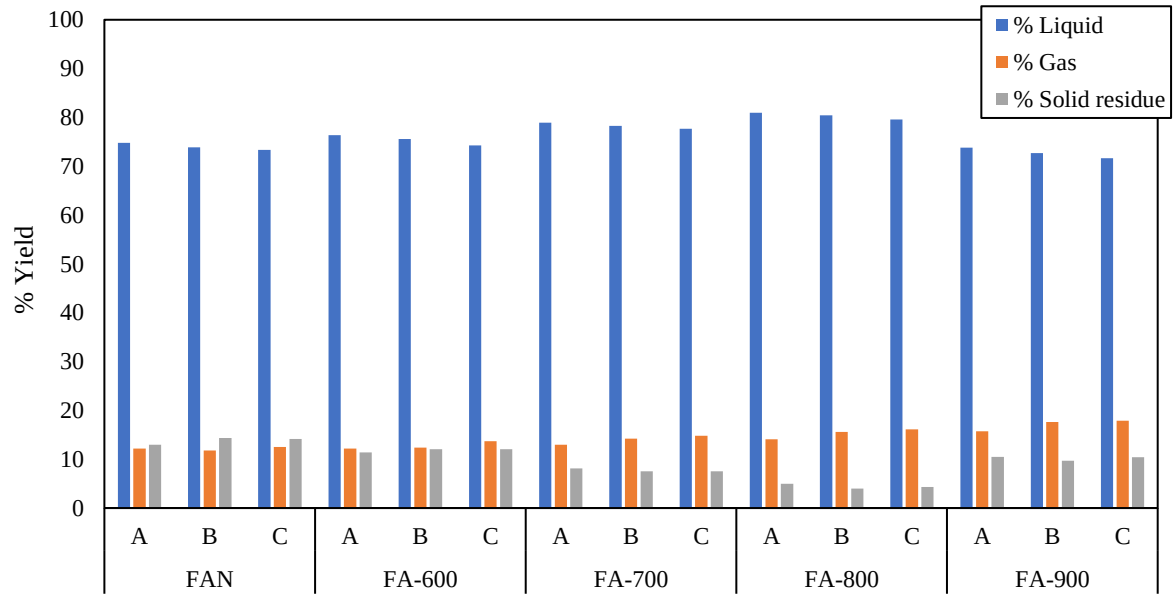


Figure A7.3b Product yield obtained from catalytic pyrolysis of polystyrene using A-type, B-type and C-type reactor arrangements at the temperature of 600 ºC.

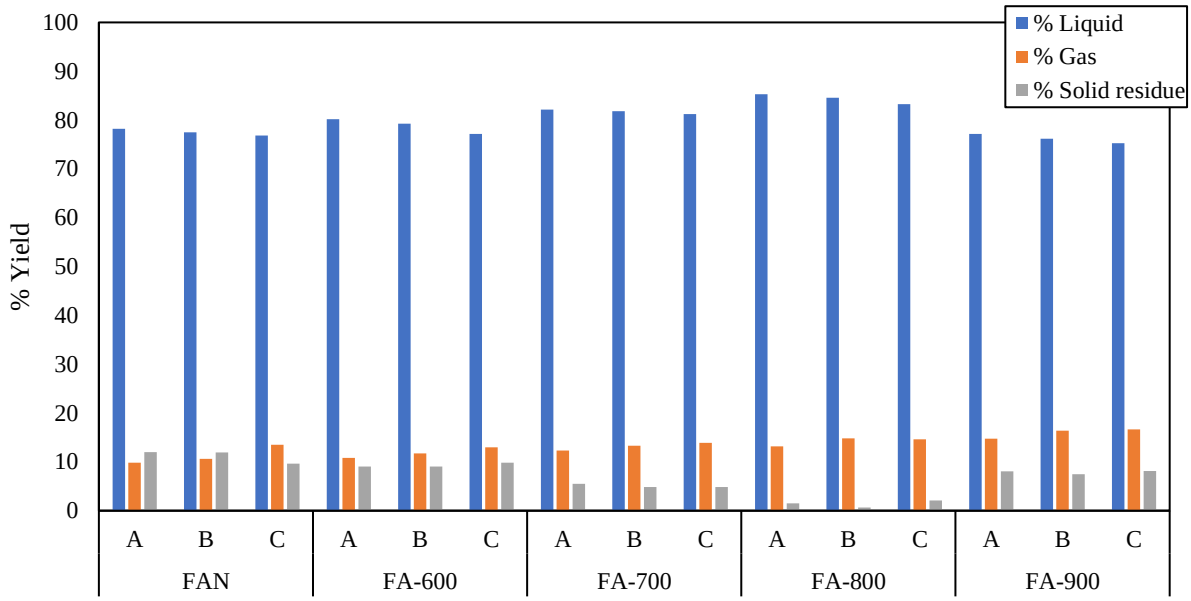


Figure A7.3c Product yield obtained from catalytic pyrolysis of polystyrene using A-type, B-type and C-type reactor arrangements at the temperature of 800 ºC.

APPENDIX A8

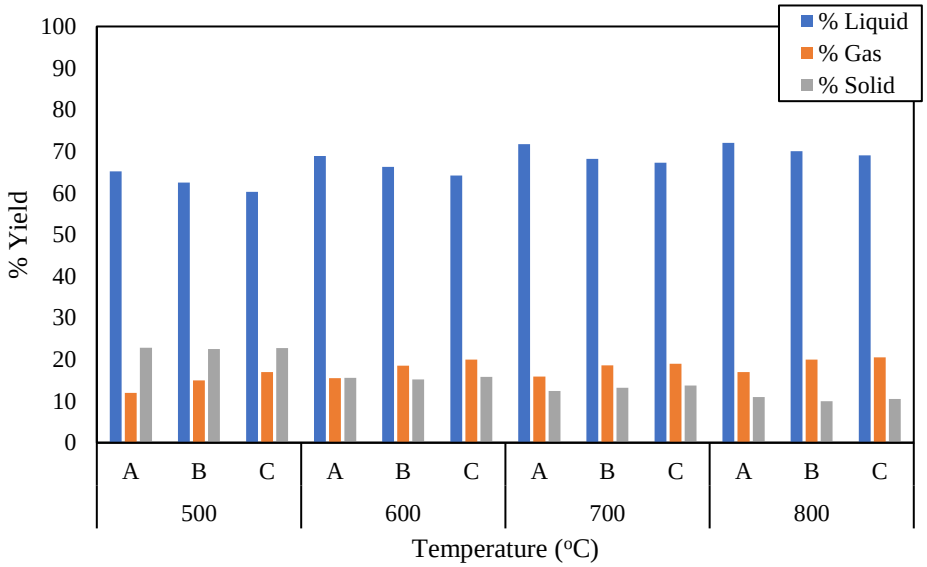


Figure A8.1a Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polyethylene for reactor arrangements A-type, B-type and C-type using catalyst FAN.

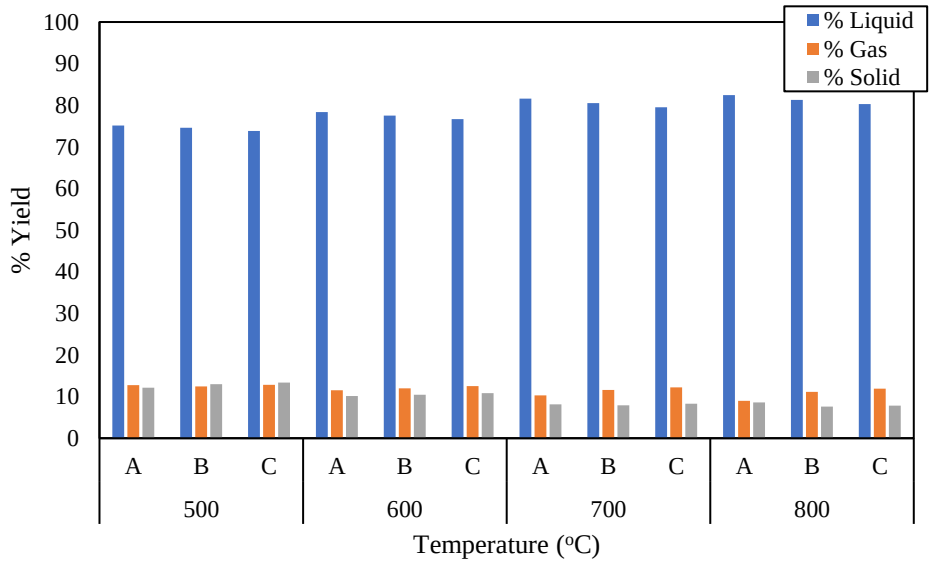


Figure A8.1b Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polypropylene for reactor arrangements A-type, B-type and C-type using catalyst FAN.

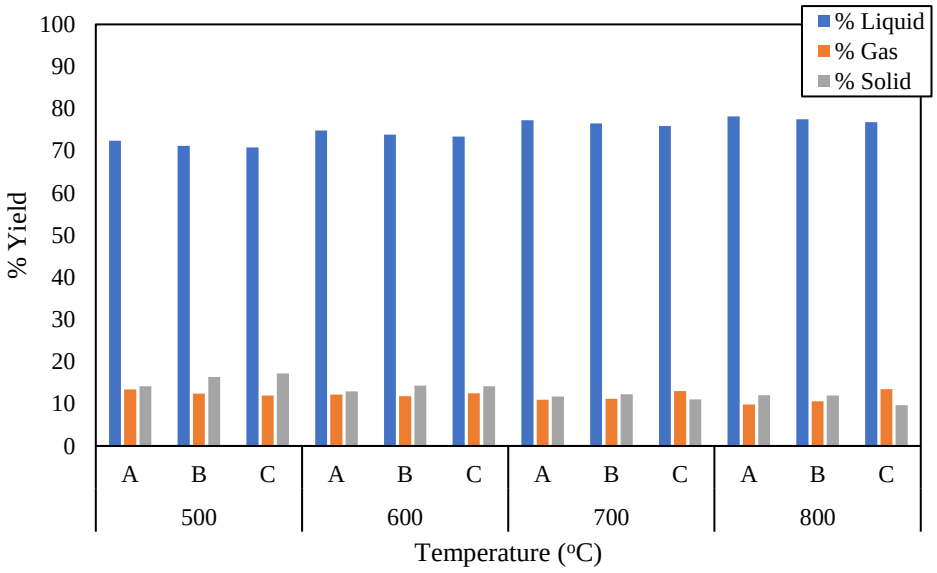


Figure A8.1c Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polystyrene for reactor arrangements A-type, B-type and C-type using catalyst FAN.

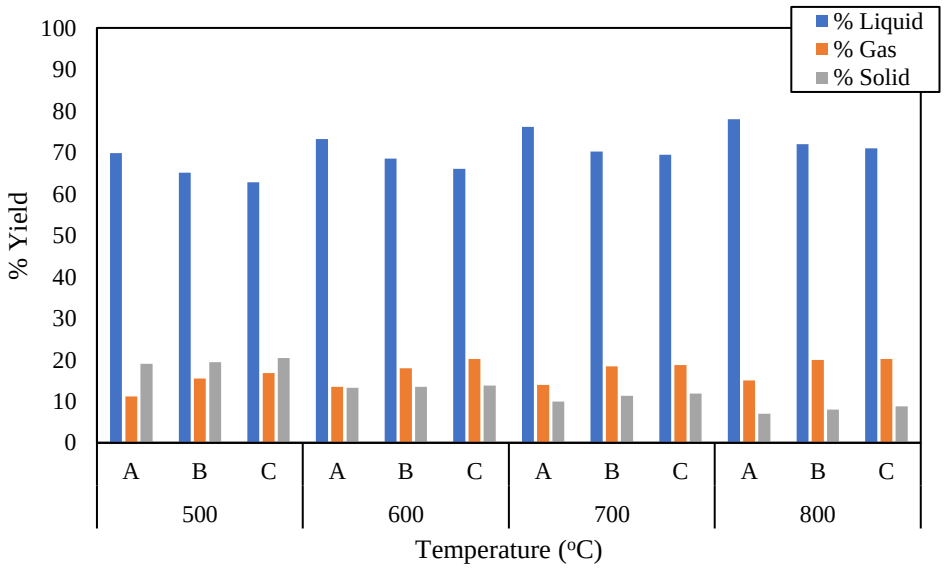


Figure A8.2a Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polyethylene for reactor arrangements A-type, B-type and C-type using catalyst FA-600.

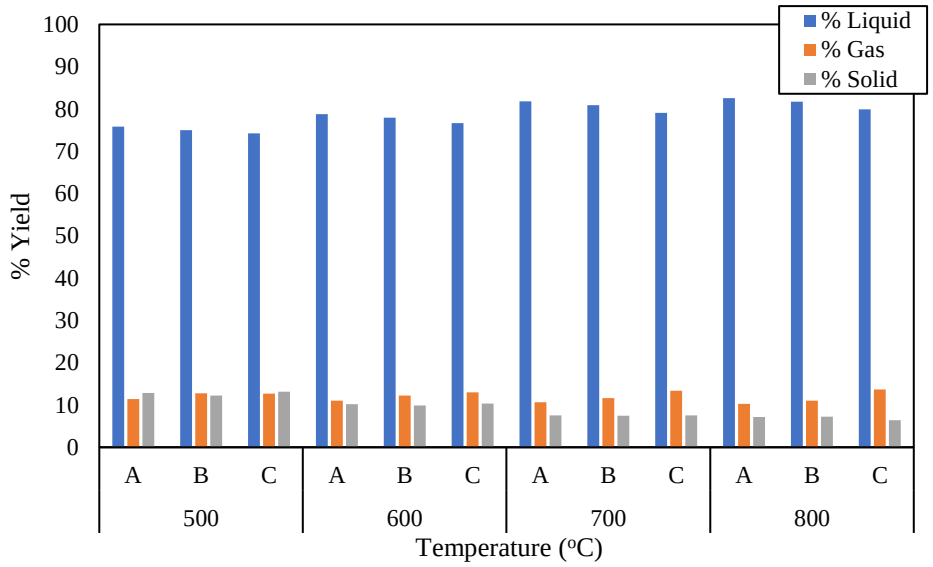


Figure A8.2b Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polypropylene for reactor arrangements A-type, B-type and C-type using catalyst FA-600.

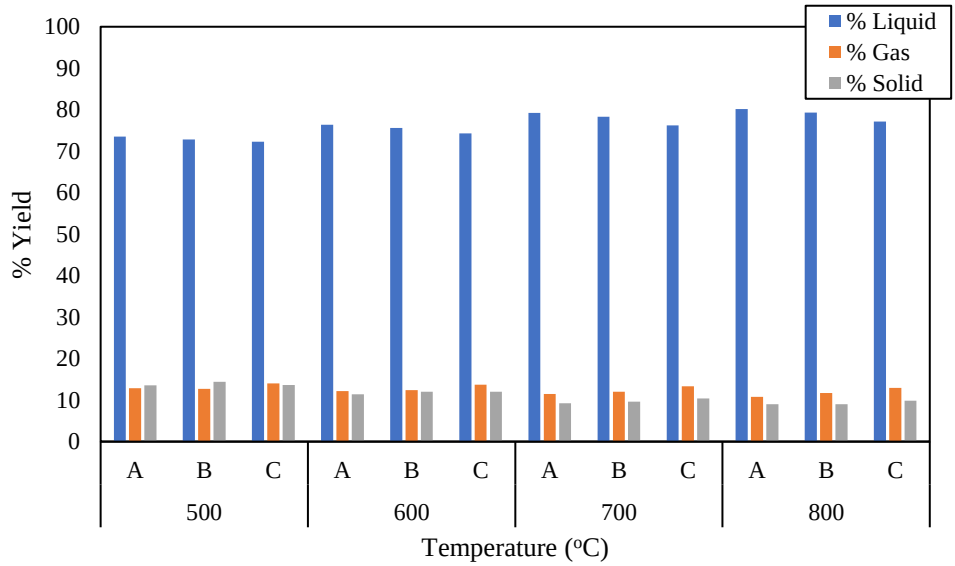


Figure A8.2c Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polystyrene for reactor arrangements A-type, B-type and C-type using catalyst FA-600.

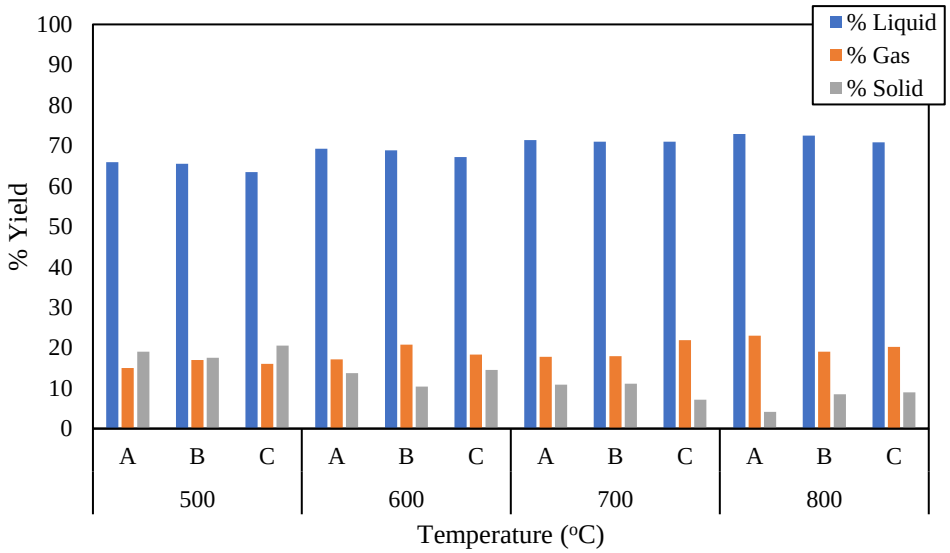


Figure A8.3a Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polyethylene for reactor arrangements A-type, B-type and C-type using catalyst FA-700.

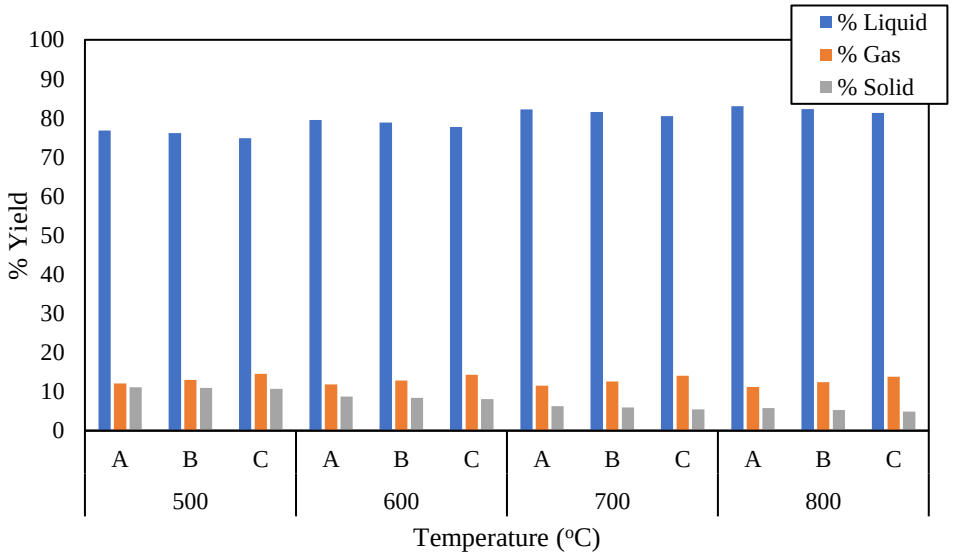


Figure A8.3b Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polypropylene for reactor arrangements A-type, B-type and C-type using catalyst FA-700.

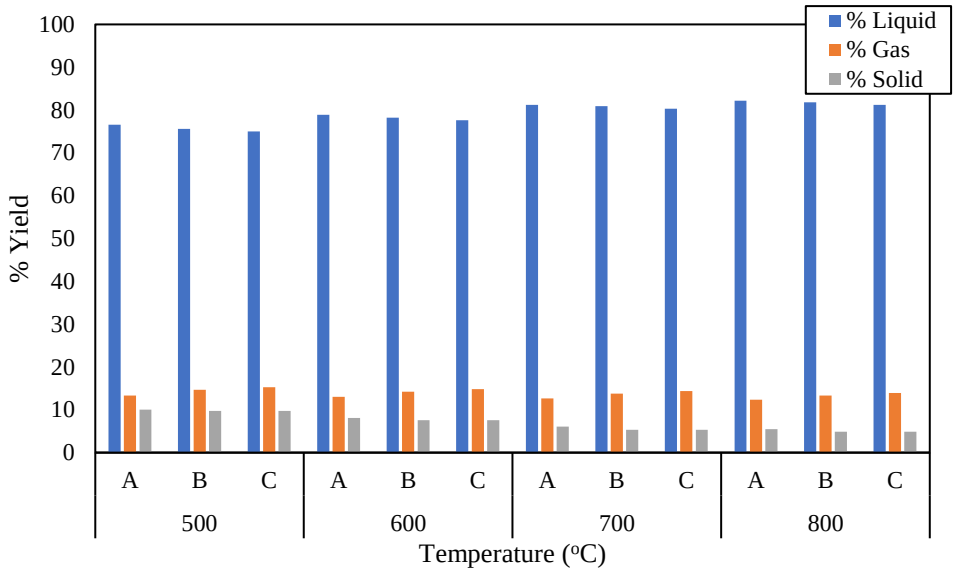


Figure A8.3c Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polystyrene for reactor arrangements A-type, B-type and C-type using catalyst FA-700.

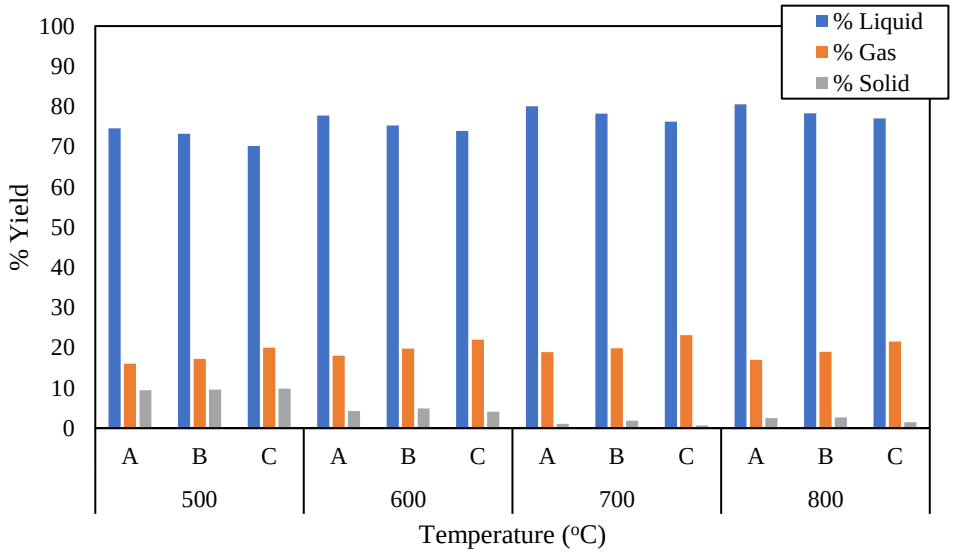


Figure A8.4a Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polyethylene for reactor arrangements A-type, B-type and C-type using catalyst FA-900.

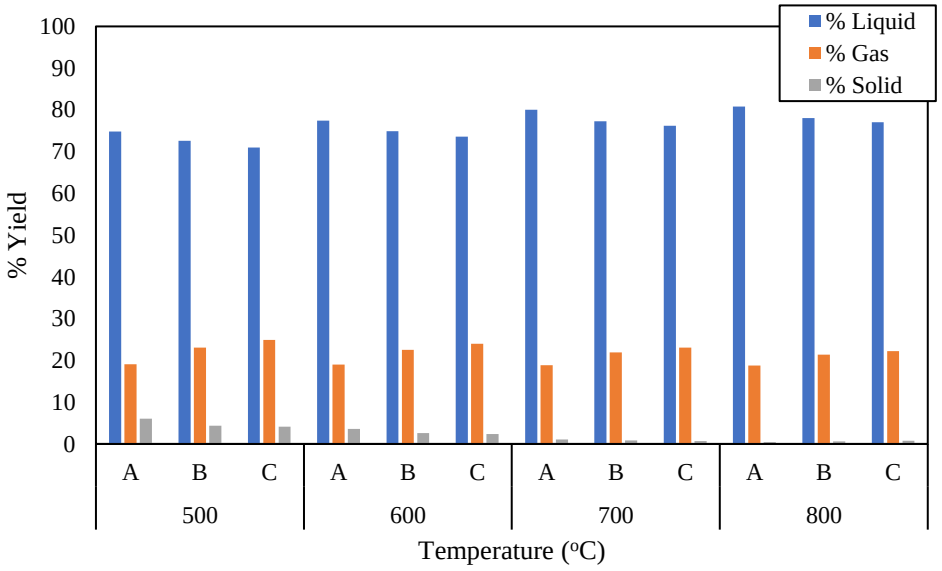


Figure A8.4b Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polypropylene for reactor arrangements A-type, B-type and C-type using catalyst FA-900.

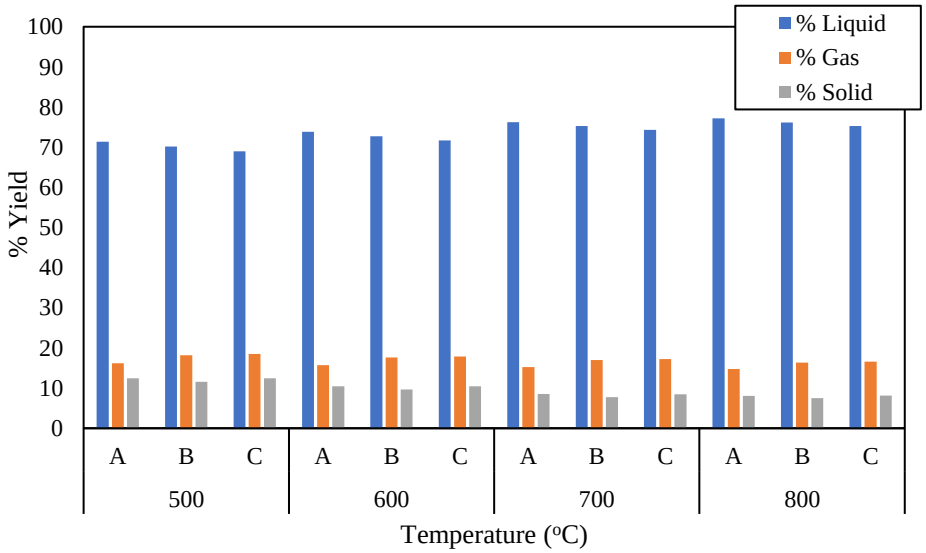


Figure A8.4c Comparison of liquid, gas and solid yield obtained from catalytic pyrolysis of polystyrene for reactor arrangements A-type, B-type and C-type using catalyst FA-900.

APPENDIX A9

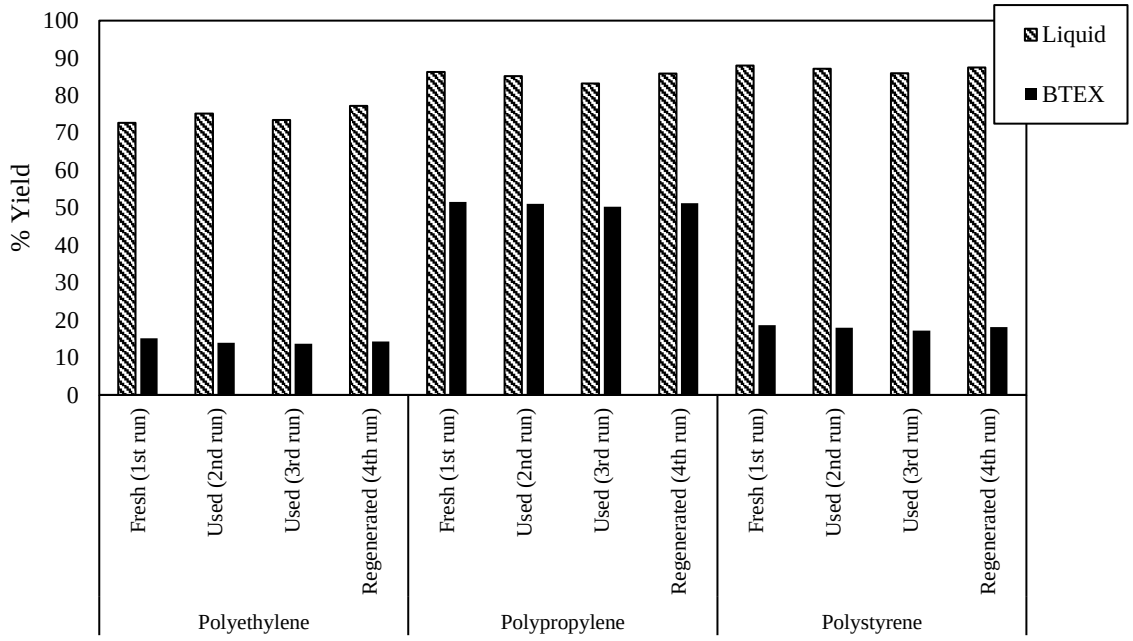


Figure A9.1a Comparison of liquid and BTEX yield for catalytic pyrolysis of PE, PP and PS using A-type reactor arrangement at the temperature of 700 ^{o}C for ZSM-5 upto 3rd run and regenerated catalyst.

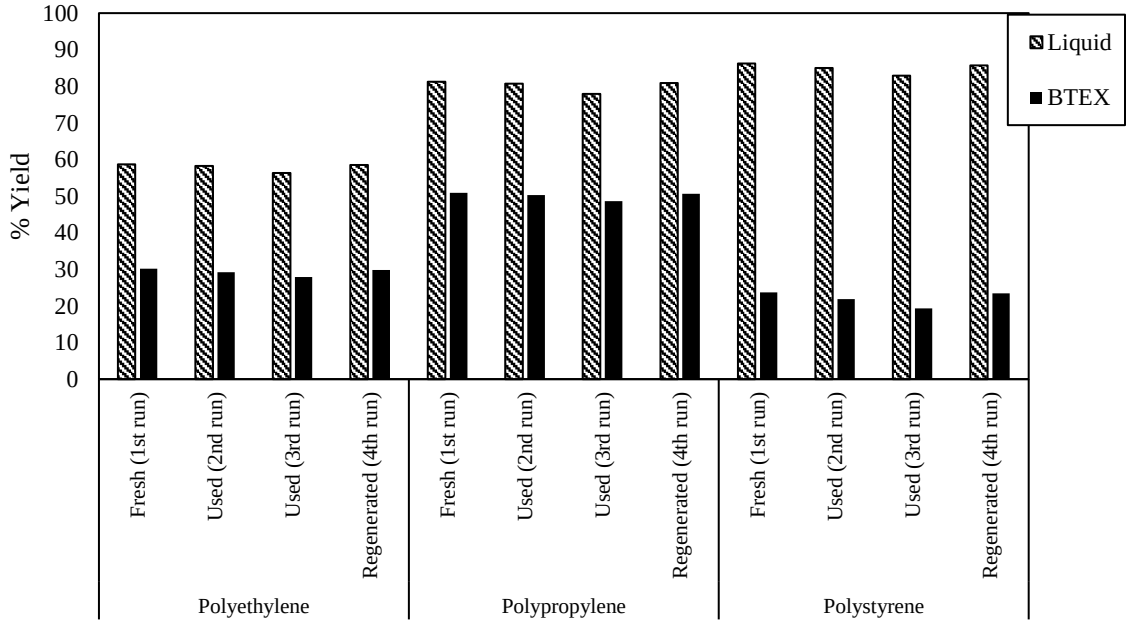


Figure A9.1b Comparison of liquid and BTEX yield for catalytic pyrolysis of PE, PP and PS using B-type reactor arrangement at the temperature of 700 ^{o}C for ZSM-5 upto 3rd run and regenerated catalyst.

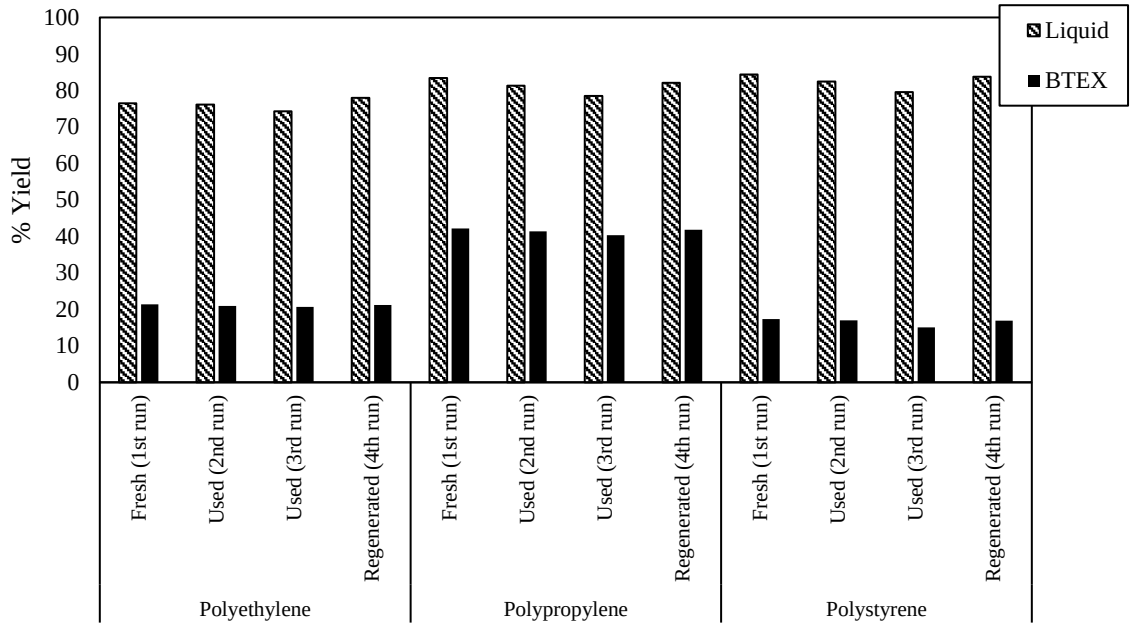


Figure A9.2a Comparison of liquid and BTEX yield for catalytic pyrolysis of PE, PP and PS using A-type reactor arrangement at the temperature of 700 ºC for FA-800 upto 3rd run and regenerated catalyst.

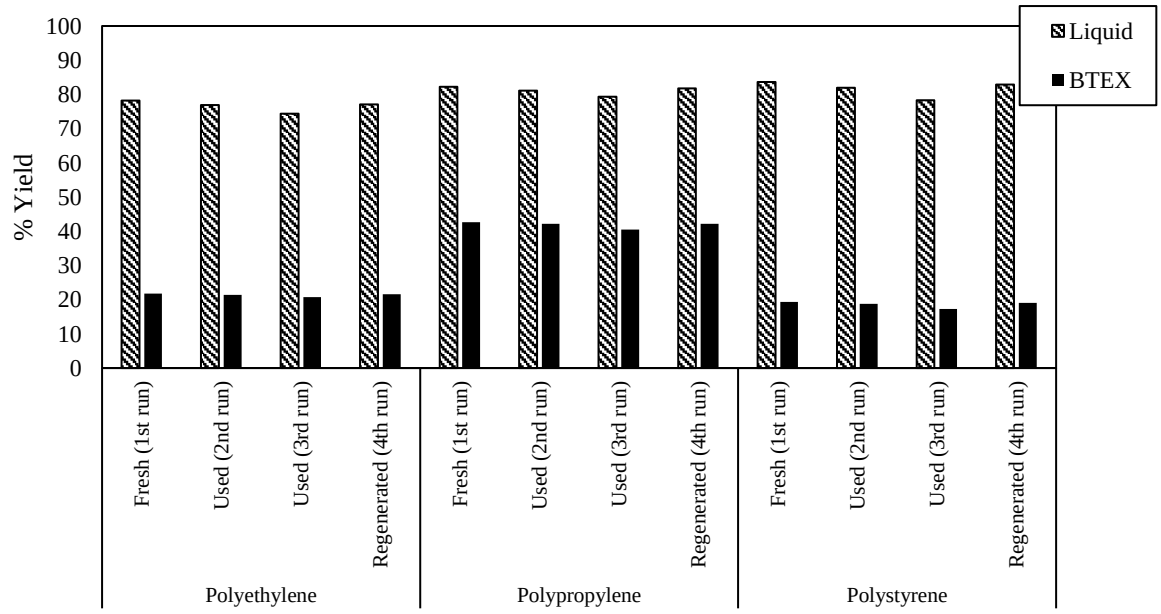


Figure A9.2b Comparison of liquid and BTEX yield for catalytic pyrolysis of PE, PP and PS using B-type reactor arrangement at the temperature of 700 ºC for FA-800 upto 3rd run and regenerated catalyst.