

The Global Advanced (Chemical or Feedstock) Recycling Market 2025-2040

https://marketpublishers.com/r/GEEF04639D2FEN.html

Date: March 2025 Pages: 363 Price: US\$ 1,300.00 (Single User License) ID: GEEF04639D2FEN

Abstracts

Advanced recycling, sometimes referred to as chemical or feedstock recycling, is a process that breaks down waste to the molecular level so it can be converted to new raw materials. The advanced recycling market is experiencing major growth as stakeholders seek solutions for previously unrecyclable plastic waste. Unlike mechanical recycling, which primarily reshapes polymers, advanced recycling breaks materials down to molecular building blocks, enabling true circularity for a wider range of plastics and other materials.

The market is driven by increasing regulatory pressure, corporate sustainability commitments, and technological maturation across multiple conversion platforms. Leading technologies include pyrolysis, gasification, solvolysis, and depolymerization, each targeting specific polymer streams or end-product applications. Investment flows into the sector have accelerated dramatically, with over \$7.5 billion committed since 2020. This integration of advanced recycling with conventional petrochemical infrastructure creates deployment advantages through existing distribution networks and technical expertise.

Regulatory frameworks increasingly support advanced recycling adoption. The European Union's Circular Economy Action Plan and Plastic Packaging Levy create direct economic incentives for recycled content, while the U.S. EPA and state-level legislation increasingly recognize chemical recycling as legitimate recycling rather than waste disposal. Challenges persist despite these advances. Capital intensity remains high at \$1,500-4,000 per ton of annual capacity, creating economic barriers to rapid scaling. Process yield and energy efficiency improvements continue through catalyst development and process integration, gradually improving economics. Feedstock quality and consistency represent operational challenges, with contaminants potentially



affecting catalyst performance and product quality.

Market forecasts suggest advanced recycling will process 20-25 million tons of plastic waste annually by 2030, representing approximately 5-7% of global plastic production. While still a modest fraction of total plastics volume, this represents significant growth from current levels (



Contents

1 CLASSIFICATION OF RECYCLING TECHNOLOGIES

2 RESEARCH METHODOLOGY

3 INTRODUCTION

- 3.1 Global production of plastics
- 3.2 The importance of plastic
- 3.3 Issues with plastics use
- 3.4 Bio-based or renewable plastics
- 3.4.1 Drop-in bio-based plastics
- 3.4.2 Novel bio-based plastics
- 3.5 Biodegradable and compostable plastics
 - 3.5.1 Biodegradability
- 3.5.2 Compostability
- 3.6 Plastic pollution
- 3.7 Policy and regulations
- 3.8 The circular economy
- 3.9 Plastic recycling
 - 3.9.1 Mechanical recycling
 - 3.9.1.1 Closed-loop mechanical recycling
 - 3.9.1.2 Open-loop mechanical recycling
 - 3.9.1.3 Polymer types, use, and recovery
 - 3.9.2 Advanced recycling (molecular recycling, chemical recycling)
 - 3.9.2.1 Main streams of plastic waste
 - 3.9.2.2 Comparison of mechanical and advanced chemical recycling
- 3.10 Life cycle assessment

4 THE ADVANCED RECYCLING MARKET

- 4.1 Market drivers and trends
- 4.1.1 Growing Environmental Concerns
- 4.1.2 Stringent Regulatory Policies
- 4.1.3 Corporate Sustainability Initiatives
- 4.1.4 Technological Advancements
- 4.1.5 Circular Economy Adoption
- 4.2 Market Challenges and Restraints



- 4.2.1 High Initial Investment Costs
- 4.2.2 Technical Challenges
- 4.2.3 Infrastructure Limitations
- 4.2.4 Technological Barriers
- 4.2.5 Supply Chain Complexities
- 4.2.6 Cost Competitiveness
- 4.3 Industry news, funding and developments 2020-2025
- 4.4 Capacities
- 4.5 Global polymer demand 2022-2040, segmented by recycling technology
 - 4.5.1 PE
 - 4.5.2 PP
 - 4.5.3 PET
 - 4.5.4 PS
 - 4.5.5 Nylon
 - 4.5.6 Others

4.6 Global polymer demand 2022-2040, segmented by recycling technology, by region

- 4.6.1 Europe
- 4.6.2 North America
- 4.6.3 South America
- 4.6.4 Asia
- 4.6.5 Oceania
- 4.6.6 Africa
- 4.7 Chemically recycled plastic products
- 4.8 Market map
- 4.9 Value chain
- 4.10 Life Cycle Assessments (LCA) of advanced chemical recycling processes
 - 4.10.1 PE
 - 4.10.2 PP
- 4.10.3 PET
- 4.11 Recycled plastic yield and cost
 - 4.11.1 Plastic yield of each chemical recycling technologies
 - 4.11.2 Prices

5 ADVANCED (CHEMICAL OR FEEDSTOCK) RECYCLING TECHNOLOGIES

- 5.1 Applications
- 5.2 Pyrolysis
 - 5.2.1 Non-catalytic
 - 5.2.2 Catalytic





- 5.2.2.1 Polystyrene pyrolysis
- 5.2.2.2 Pyrolysis for production of bio fuel
- 5.2.2.3 Used tires pyrolysis
- 5.2.2.3.1 Conversion to biofuel
- 5.2.2.4 Co-pyrolysis of biomass and plastic wastes
- 5.2.3 SWOT analysis
- 5.2.4 Companies and capacities
- 5.3 Gasification
 - 5.3.1 Technology overview
 - 5.3.1.1 Syngas conversion to methanol
 - 5.3.1.2 Biomass gasification and syngas fermentation
 - 5.3.1.3 Biomass gasification and syngas thermochemical conversion
 - 5.3.2 SWOT analysis
 - 5.3.3 Companies and capacities (current and planned)
- 5.4 Dissolution
 - 5.4.1 Technology overview
 - 5.4.2 SWOT analysis
 - 5.4.3 Companies and capacities (current and planned)
- 5.5 Depolymerisation
 - 5.5.1 Hydrolysis
 - 5.5.1.1 Technology overview
 - 5.5.1.2 SWOT analysis
 - 5.5.2 Enzymolysis
 - 5.5.2.1 Technology overview
 - 5.5.2.2 SWOT analysis
 - 5.5.3 Methanolysis
 - 5.5.3.1 Technology overview
 - 5.5.3.2 SWOT analysis
 - 5.5.4 Glycolysis
 - 5.5.4.1 Technology overview
 - 5.5.4.2 SWOT analysis
 - 5.5.5 Aminolysis
 - 5.5.5.1 Technology overview
 - 5.5.5.2 SWOT analysis
- 5.5.6 Companies and capacities (current and planned)
- 5.6 Other advanced chemical recycling technologies
 - 5.6.1 Hydrothermal cracking
 - 5.6.2 Pyrolysis with in-line reforming
 - 5.6.3 Microwave-assisted pyrolysis



- 5.6.4 Plasma pyrolysis
- 5.6.5 Plasma gasification
- 5.6.6 Supercritical fluids
- 5.6.7 Carbon fiber recycling
- 5.6.7.1 Processes
- 5.6.7.2 Companies
- 5.7 Advanced recycling of thermoset materials
- 5.7.1 Thermal recycling
 - 5.7.1.1 Energy Recovery Combustion
 - 5.7.1.2 Anaerobic Digestion
- 5.7.1.3 Pyrolysis Processing
- 5.7.1.4 Microwave Pyrolysis
- 5.7.2 Solvolysis
- 5.7.3 Catalyzed Glycolysis
- 5.7.4 Alcoholysis and Hydrolysis
- 5.7.5 Ionic liquids
- 5.7.6 Supercritical fluids
- 5.7.7 Plasma
- 5.7.8 Companies
- 5.8 Comparison with Traditional Recycling Methods
 - 5.8.1 Mechanical Recycling Limitations
 - 5.8.2 Energy Efficiency Comparison
 - 5.8.3 Quality of Output Comparison
 - 5.8.4 Cost Analysis
- 5.9 Environmental Impact Assessment
 - 5.9.1 Carbon Footprint Analysis
 - 5.9.2 Energy Consumption Assessment
 - 5.9.3 Waste Reduction Potential
 - 5.9.3.1 Wastewater
 - 5.9.3.2 Atmospheric Emissions
 - 5.9.3.3 Catalyst and Media Waste
 - 5.9.3.4 Maintenance and Cleaning Waste
 - 5.9.3.5 Waste Management Approaches
 - 5.9.3.6 Regulatory Considerations and Classification
 - 5.9.3.7 Comparative Waste Production
 - 5.9.3.8 Environmental Impact and Future Directions
 - 5.9.4 Sustainability Metrics
- 5.10 Emerging Technologies
 - 5.10.1 AI and Machine Learning Applications



- 5.10.1.1 Sorting Optimization
 5.10.1.2 Process Control
 5.10.1.3 Quality Prediction
 5.10.1.4 Maintenance Prediction
 5.10.2 Robotics in Sorting
 5.10.2.1 Vision Systems
 5.10.2.2 Picking Mechanisms
 5.10.2.3 Control Systems
 5.10.2.4 Integration Methods
 5.10.3 Novel Catalyst Development
 5.10.3.1 Nano-catalysts
 - 5.10.3.2 Bio-catalysts
 - 5.10.3.3 Hybrid Catalysts

6 MATERIALS ANALYSIS

- 6.1 Plastics
 - 6.1.1 Polyethylene (PE)
 - 6.1.1.1 HDPE Analysis
 - 6.1.1.2 LLDPE Analysis
 - 6.1.1.3 Recovery Methods
 - 6.1.2 Polypropylene (PP)
 - 6.1.2.1 Homopolymer
 - 6.1.2.2 Copolymer
 - 6.1.2.3 Processing Methods
 - 6.1.2.4 Quality Grades
 - 6.1.3 Polyethylene Terephthalate (PET)
 - 6.1.3.1 Bottle Grade
 - 6.1.3.2 Fiber Grade
 - 6.1.3.3 Film Grade
 - 6.1.3.4 Recovery Technologies
 - 6.1.4 Polystyrene (PS)
 - 6.1.4.1 General Purpose PS
 - 6.1.4.2 High Impact PS
 - 6.1.4.3 Expanded PS
 - 6.1.4.4 Processing Methods
 - 6.1.5 Other Plastics
 - 6.1.5.1 PVC
 - 6.1.5.2 PC



- 6.1.5.3 ABS
- 6.1.5.4 Mixed Plastics
- 6.2 Metals
 - 6.2.1 Precious Metals
 - 6.2.1.1 Gold
 - 6.2.1.2 Silver
 - 6.2.1.3 Platinum Group Metals
 - 6.2.1.4 Recovery Methods
- 6.3 Base Metals
 - 6.3.1 Copper
 - 6.3.2 Aluminium
 - 6.3.3 Steel
 - 6.3.4 Processing Technologies
- 6.4 Rare Earth Elements
 - 6.4.1 Light REEs
 - 6.4.2 Heavy REEs
- 6.4.3 Extraction Methods
- 6.5 Electronic Waste
 - 6.5.1 Circuit Boards
 - 6.5.1.1 PCB Types
 - 6.5.1.2 Component Separation
 - 6.5.1.3 Metal Recovery
 - 6.5.1.4 Waste Management
 - 6.5.2 Batteries
 - 6.5.2.1 Lithium-ion
 - 6.5.2.2 Lead-acid
 - 6.5.2.3 Nickel-based
 - 6.5.2.4 Recovery Processes
 - 6.5.3 Displays
 - 6.5.3.1 LCD
 - 6.5.3.2 LED
 - 6.5.3.3 OLED
 - 6.5.3.4 Material Recovery
 - 6.5.4 Other Components
 - 6.5.4.1 Capacitors
 - 6.5.4.2 Resistors
 - 6.5.4.3 Semiconductors
 - 6.5.4.4 Connectors
- 6.6 Textiles



- 6.6.1 Natural Fibers
- 6.6.2 Cotton
- 6.6.3 Wool
- 6.6.4 Silk
- 6.6.5 Processing Methods
- 6.7 Synthetic Fibers
 - 6.7.1 Polyester
 - 6.7.2 Nylon
 - 6.7.3 Acrylic
 - 6.7.4 Recovery Technologies

7 END PRODUCT ANALYSIS

- 7.1 Chemical Feedstocks
 - 7.1.1 Monomers
 - 7.1.2 Oligomers
 - 7.1.3 Specialty Chemicals
- 7.2 Fuels
 - 7.2.1 Diesel
 - 7.2.2 Gasoline
- 7.2.3 Synthetic Gas
- 7.3 Raw Materials
 - 7.3.1 Recycled Plastics
 - 7.3.2 Recovered Metals
- 7.3.3 Other Materials
- 7.4 Energy Products
 - 7.4.1 Electricity
 - 7.4.2 Heat
 - 7.4.3 Biofuels

8 COMPANY PROFILES 218 (193 COMPANY PROFILES)

9 GLOSSARY OF TERMS

10 REFERENCES





List Of Tables

LIST OF TABLES

- Table 1. Types of recycling.
- Table 2. Global plastics production 1950-2023, millions of tonnes.
- Table 3. Issues related to the use of plastics.
- Table 4. Type of biodegradation.
- Table 5. Overview of the recycling technologies.
- Table 6. Polymer types, use, and recovery.
- Table 7. Composition of plastic waste streams.
- Table 8. Comparison of mechanical and advanced chemical recycling.

Table 9. Life cycle assessment of virgin plastic production, mechanical recycling and chemical recycling.

Table 10. Life cycle assessment of chemical recycling technologies (pyrolysis,

gasification, depolymerization and dissolution).

- Table 11. Market drivers and trends in the advanced chemical recycling market.
- Table 12. Global regulations driving plastics recycling.
- Table 13. Corporate Sustainability Initiatives.
- Table 14. Technological Advancements.
- Table 15. Technical Challenges.
- Table 16. Technological Barriers.
- Table 17. Cost Competitiveness Analysis.

Table 18. Advanced chemical recycling industry news, funding and developments 2020-2025.

Table 19. Advanced chemical recycling capacities, by technology.

Table 20. Global polymer demand 2022-2040, segmented by recycling technology for PE (million tonnes).

Table 21. Global polymer demand 2022-2040, segmented by recycling technology for PP (million tonnes).

Table 22. Global polymer demand 2022-2040, segmented by recycling technology for PET (million tonnes).

Table 23. Global polymer demand 2022-2040, segmented by recycling technology for PS (million tonnes).

Table 24. Global polymer demand 2022-2040, segmented by recycling technology for Nylon (million tonnes).

Table 25. Global polymer demand 2022-2040, segmented by recycling technology for Other types (million tonnes).*

Table 26. Global polymer demand in Europe, by recycling technology 2022-2040



(million tonnes).

Table 27. Global polymer demand in North America, by recycling technology 2022-2040 (million tonnes).

Table 28. Global polymer demand in South America, by recycling technology 2022-2040 (million tonnes).

Table 29. Global polymer demand in Asia, by recycling technology 2022-2040 (million tonnes).

Table 30. Global polymer demand in Oceania, by recycling technology 2022-2040 (million tonnes).

Table 31. Global polymer demand in Africa, by recycling technology 2022-2040 (million tonnes).

Table 32. Example chemically recycled plastic products.

Table 33. Life Cycle Assessments (LCA) of Advanced chemical recycling Processes.

Table 34. Life cycle assessment of mechanically versus chemically recycling polyethylene (PE).

Table 35. Life cycle assessment of mechanically versus chemically recycling polypropylene (PP).

Table 36. Life cycle assessment of mechanically versus chemically recycling polyethylene terephthalate (PET).

Table 37. Plastic yield of each chemical recycling technologies.

Table 38. Chemically recycled plastics prices in USD.

Table 39. Applications of chemically recycled materials.

Table 40. Summary of non-catalytic pyrolysis technologies.

Table 41. Summary of catalytic pyrolysis technologies.

Table 42. Summary of pyrolysis technique under different operating conditions.

Table 43. Biomass materials and their bio-oil yield.

Table 44. Biofuel production cost from the biomass pyrolysis process.

Table 45. Pyrolysis companies and plant capacities, current and planned.

Table 46. Summary of gasification technologies.

Table 47. Advanced recycling (Gasification) companies.

Table 48. Summary of dissolution technologies.

Table 49. Advanced recycling (Dissolution) companies

Table 50. Depolymerisation processes for PET, PU, PC and PA, products and yields.

Table 51. Summary of hydrolysis technologies-feedstocks, process, outputs,

commercial maturity and technology developers.

Table 52. Summary of Enzymolysis technologies-feedstocks, process, outputs, commercial maturity and technology developers.

Table 53. Summary of methanolysis technologies-feedstocks, process, outputs, commercial maturity and technology developers.



Table 54. Summary of glycolysis technologies-feedstocks, process, outputs, commercial maturity and technology developers.

Table 55. Summary of aminolysis technologies.

Table 56. Advanced recycling (Depolymerisation) companies and capacities (current and planned).

Table 57. Overview of hydrothermal cracking for advanced chemical recycling.

Table 58. Overview of Pyrolysis with in-line reforming for advanced chemical recycling.

Table 59. Overview of microwave-assisted pyrolysis for advanced chemical recycling.

Table 60. Overview of plasma pyrolysis for advanced chemical recycling.

Table 61. Overview of plasma gasification for advanced chemical recycling.

Table 62. Summary of carbon fiber (CF) recycling technologies. Advantages and disadvantages.

Table 63. Retention rate of tensile properties of recovered carbon fibres by different recycling processes.

Table 64. Recycled carbon fiber producers, technology and capacity.

Table 65. Current thermoset recycling routes.

Table 66. Companies developing advanced thermoset recycing routes.

Table 67. Comparison of Advanced Chemical Recycling with Traditional Recycling Methods.

Table 68. Energy Efficiency Comparison: Advanced Chemical Recycling vs. Mechanical Recycling

Table 69. Quality of Output Comparison.

Table 70. Cost Analysis of advanced plastic recycling versus traditional recycling methods.

- Table 71. Carbon Footprint Analysis.
- Table 72. Energy Consumption Assessment.
- Table 73. Sustainability Metrics.
- Table 74. AI and Machine Learning Applications.
- Table 75. Types of Nano-catalysts.
- Table 76. Types of bio-catalysts.
- Table 77. Advanced polyethylene recovery methods.
- Table 78. Polypropylene processing methods for chemical recycling.
- Table 79. PP Quality Grades from Chemical Recycling.
- Table 80. Advanced PET recovery technologies .
- Table 81. Advanced chemical recycling of metals.
- Table 82. Precious metals recovery methods.
- Table 83. Advanced processing technologies for base metal recycling .

Table 84. Rare Earth Elements Extraction Methods.

Table 85. Recovery Processes for Batteries.



Table 86. Advanced technologies for materials recovery in displays.

Table 87. Processing Methods for Natural Fiber Recycling.

 Table 88. Recovery Technologies for Synthetic Fibers

Table 89. Monomers from chemical recycling.

Table 90. Oligomers from advanced recycling.



List Of Figures

LIST OF FIGURES

Figure 1. Global plastics production 1950-2023, millions of tonnes.

Figure 2. Coca-Cola PlantBottle®.

Figure 3. Interrelationship between conventional, bio-based and biodegradable plastics.

Figure 4. Global production, use, and fate of polymer resins, synthetic fibers, and additives.

Figure 5. The circular plastic economy.

Figure 6. Current management systems for waste plastics.

Figure 7. Overview of the different circular pathways for plastics.

Figure 8. Global polymer demand 2022-2040, segmented by recycling technology for PE (million tonnes).

Figure 9. Global polymer demand 2022-2040, segmented by recycling technology for PP (million tonnes).

Figure 10. Global polymer demand 2022-2040, segmented by recycling technology for PET (million tonnes).

Figure 11. Global polymer demand 2022-2040, segmented by recycling technology for PS (million tonnes).

Figure 12. Global polymer demand 2022-2040, segmented by recycling technology for Nylon (million tonnes).

Figure 13. Global polymer demand 2022-2040, segmented by recycling technology for Other types (million tonnes).

Figure 14. Global polymer demand in Europe, by recycling technology 2022-2040 (million tonnes).

Figure 15. Global polymer demand in North America, by recycling technology 2022-2040 (million tonnes).

Figure 16. Global polymer demand in South America, by recycling technology 2022-2040 (million tonnes).

Figure 17. Global polymer demand in Asia, by recycling technology 2022-2040 (million tonnes).

Figure 18. Global polymer demand in Oceania, by recycling technology 2022-2040 (million tonnes).

Figure 19. Global polymer demand in Africa, by recycling technology 2022-2040 (million tonnes).

Figure 20. Market map for advanced plastics recycling.

Figure 21. Value chain for advanced chemical recycling market.

Figure 22. Schematic layout of a pyrolysis plant.



- Figure 23. Waste plastic production pathways to (A) diesel and (B) gasoline
- Figure 24. Schematic for Pyrolysis of Scrap Tires.
- Figure 25. Used tires conversion process.
- Figure 26. SWOT analysis-pyrolysis for advanced recycling.
- Figure 27. Total syngas market by product in MM Nm?/h of Syngas, 2021.
- Figure 28. Overview of biogas utilization.
- Figure 29. Biogas and biomethane pathways.
- Figure 30. SWOT analysis-gasification for advanced recycling.
- Figure 31. SWOT analysis-dissoluton for advanced recycling.
- Figure 32. Products obtained through the different solvolysis pathways of PET, PU, and PA.
- Figure 33. SWOT analysis-Hydrolysis for advanced chemical recycling.
- Figure 34. SWOT analysis-Enzymolysis for advanced chemical recycling.
- Figure 35. SWOT analysis-Methanolysis for advanced chemical recycling.
- Figure 36. SWOT analysis-Glycolysis for advanced chemical recycling.
- Figure 37. SWOT analysis-Aminolysis for advanced chemical recycling.
- Figure 38. Alterra's Akron Plant in Ohio.
- Figure 39. ChemCyclingTM prototypes.
- Figure 40. ChemCycling circle by BASF.
- Figure 41. Recycled carbon fibers obtained through the R3FIBER process.
- Figure 42. Cassandra Oil process.
- Figure 43. CuRe Technology process.
- Figure 44. MoReTec.
- Figure 45. Chemical decomposition process of polyurethane foam.
- Figure 46. OMV ReOil process.
- Figure 47. Schematic Process of Plastic Energy's TAC Chemical Recycling.
- Figure 48. Easy-tear film material from recycled material.
- Figure 49. Polyester fabric made from recycled monomers.
- Figure 50. A sheet of acrylic resin made from conventional, fossil resource-derived
- MMA monomer (left) and a sheet of acrylic resin made from chemically recycled MMA monomer (right).
- Figure 51. Teijin Frontier Co., Ltd. Depolymerisation process.
- Figure 52. The Velocys process.
- Figure 53. The Proesa® Process.
- Figure 54. Worn Again products.



I would like to order

Product name: The Global Advanced (Chemical or Feedstock) Recycling Market 2025-2040 Product link: <u>https://marketpublishers.com/r/GEEF04639D2FEN.html</u>

Price: US\$ 1,300.00 (Single User License / Electronic Delivery) If you want to order Corporate License or Hard Copy, please, contact our Customer Service: <u>info@marketpublishers.com</u>

Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <u>https://marketpublishers.com/r/GEEF04639D2FEN.html</u>