International Journal of Innovation and Industrial Revolution IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 735-748
DOI 10.35631/IJIREV.722041

INTERNATIONAL JOURNAL OF INNOVATION AND INDUSTRIAL REVOLUTION (IJIREV)
www.ijirev.com

GLOBAL ACADEMIC EXCELLENCE

A SYSTEMATIC REVIEW OF PYROLYSIS BASED LIQUID FUEL CONVERSION FROM PLASTIC WASTE

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Article Info:

Article history:
Received date: 17.06.2025
Revised date: 15.07.2025
Accepted date: 28.08.2025
Published date: 22.09.2025

To cite this document:

Wan Muhammad, W. N. A., & Mohamad, M. N. A. (2025). A Systematic Review Of Pyrolysis Based Liquid Fuel Conversion From Plastic Waste. *International Journal of Innovation and Industrial Revolution, 7* (22), 735-748.

DOI: 10.35631/IJIREV.722041

Abstract:

The escalating accumulation of plastic waste poses a pressing environmental and resource challenge, prompting the need for sustainable conversion technologies. Pyrolysis has emerged as a promising thermochemical route for transforming waste plastics into liquid fuels with potential to partially replace conventional fossil-derived fuels. However, progress in this domain remains fragmented, necessitating a comprehensive synthesis of recent advancements. This study presents a systematic literature review (SLR) on pyrolysis-based liquid fuel production from plastic waste, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol. Relevant studies were retrieved from two major databases—Web of Science and Scopus—using carefully constructed search strings, resulting in 26 primary studies meeting the inclusion criteria. The findings were synthesized into three thematic domains: (1) Catalyst Development and Catalytic Mechanisms in Pyrolysis, which highlights advances in catalyst formulation, active site engineering, and reaction pathway elucidation for enhanced product selectivity; (2) Process Optimization, Kinetics, and Mechanistic Studies, focusing on the impact of operating parameters, reactor configurations, and kinetic modelling on maximizing liquid fuel yields and process efficiency; and (3) Fuel Production, Engine Application, and Environmental Assessment, which evaluates fuel quality upgrades, engine performance compatibility, and potential environmental benefits in reducing waste volumes and greenhouse gas emissions. The analysis reveals that catalytic pyrolysis consistently delivers higher-quality liquid fuels, with several studies reporting yield improvements exceeding 20% over non-catalytic processes. Process parameter tuning and kinetic insights further contribute to efficiency gains and targeted hydrocarbon profiles. In conclusion, pyrolysis offers significant potential for sustainable plastic waste valorization, but future research should emphasize

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integrative approaches linking catalyst innovation, process optimization, and real-world application to achieve scalable, economically viable, and environmentally responsible solutions.

Keywords:

Plastic Waste, Pyrolysis, Reaction Mechanism, Catalyst

Introduction

The mounting stockpile of disposable plastic is an environmental challenge, which requires the development of creative ways of handling plastic as well as mobilizing it for useful products. Pyrolysis is one of the potential methods, which is a thermochemical process and converts plastic wastes into gases, liquid fuels, as well as solid remains in the absence of oxygen. In addition, pyrolysis provides a sustainable way of recycling mixed and unwashed plastic wastes to produce beneficial hydrocarbons like diesel, crude oil, as well as gasoline (Scheirs *et al.,* 2006; Banurea *et al.,* 2024; Patrusheva *et al.,* 2022). The given technology has solved the problem of plastic waste utilization and can be used to produce energy, which is in line with the goals of energy security in the global environment (Patrusheve *et al.,* 2022; Misra *et al.,* 2025). A wide range of plastics is possible to treat with pyrolysis using polystyrene (PS), polyethylene terephthalate (PET), high-density polyethylene (HDPE), low-density polyethylene (LDPE), polypropylene (PP), as well as polyvinyl chloride (PVC) (Abnisa *et al.,* 2021; Demirbas & Taylan, 2015).

Pyrolysis continues to improve annually due to the improvement in various aspects of this procedure, namely, reactor design, improvement in catalysts, as well as process fine-tuning, which boosts its effectiveness and its economic profitability. Current environments of pyrolysis are capable of transforming plastic waste into high-quality liquid fuel with similar qualities to ordinary petroleum-based (Banurea *et al.,* 2024; Lorenia *et al.,* 2023; Saramath & Chanathaworn, 2024). Illustratively, the pyrolysis oil that is produced using PP and HDPE plastics has certain gravities that are similar to those of diesel and gasoline, and this product can be proposed as well as used as an alternative to transportation and industry 2. Already, the addition of catalysts like zeolite, $Ca(OH)_2$, and Fe_2O_3 has also led to increased yield as well as quality of the pyrolysis goods through increased rupture of long hydrocarbon chains and by discouraging production of unwanted byproducts (Demirbas & Taylan, 2015; Lorenia *et al.,* 2023; Ezeokolie *et al.,* 2025). Moreover, biomass co-pyrolysis has been investigated so as to synergistically increase the hydrogen to carbon ratio to make higher amounts of valuable hydrocarbons (Rahman *et al.,* 2023).

Commercialization of pyrolysis technology has shown that it has the potential to help in a circular economy where waste plastics are converted to useful fuels and chemicals. Some of the large-scale pyrolysis units have already been installed, which can work with considerable amounts of plastic waste volumes to generate large amounts of liquid fuel (Lee *et al.,* 2021; Hasan *et al.,* 2024). Such plants employ the use of superior distillation technologies to refine crude pyrolysis oil into products like diesel, gasoline, and kerosene while making sure to obtain high-quality fuels (Lee *et al.,* 2021). Besides, the combination of pyrolysis and other waste management methods, i.e., incineration and mechanical recycling, may lead to an increase in the efficiency and sustainability of the entire waste management process (Butler *et al.,* 2011). The potential of this technology in dealing with the twin problems of energy generation as well

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as plastic waste management is enormous, following the endless research in optimizing the process of pyrolysis and even coming up with novel catalysts.

Table 1: Summary of Literature Review

Aspects	Details
Environmental challenge	Accumulation of plastic waste necessitates innovative management solutions.
Pyrolysis process	Thermochemical decomposition of plastic waste into liquid fuels, gases, and solid residues under oxygen-free conditions.
Types of plastics	Suitable for various plastics including PET, PS, LDPE, HDPE, PVC, and PP.
Advancements	Improved reactor design, catalyst development, and process optimization enhance efficiency and commercial viability.
Catalysts	Use of catalysts like zeolite, $Ca(OH)_2$, and Fe_2O_3 improves product yield and quality.
Co-pyrolysis	Combining plastics with biomass enhances hydrogen-to-carbon ratio, increasing valuable hydrocarbon yields.
Commercial implementation	Established commercial-scale plants produce high-quality liquid fuels, integrating with other waste management strategies.
Future potential	Ongoing research aims to further optimize processes and develop new catalysts, promising solutions for plastic waste management and energy protection.

This comprehensive review highlights the potential of pyrolysis as a sustainable solution for utilizing plastic waste to produce precious liquid fuels, faces the environmental and energy problems.

In conclusion, Figure 1 illustrates the comprehensive framework of pyrolysis-based liquid fuel conversion from plastic waste, demonstrating the interconnected relationship between three key domains: plastic waste management, pyrolysis technology, and sustainability considerations. The framework begins with plastic waste management, encompassing various waste plastic types involving High-density Polyethylene (HDPE) as well as Low-density Polyethylene (LDPE) along with recycling techniques that provide feedstock for the conversion process. The core pyrolysis technology branches into thermal and catalytic pyrolysis pathways, with catalytic processes utilizing zeolites as catalysts despite facing catalyst deactivation challenges, ultimately producing pyrolytic oil as the primary liquid fuel product. The sustainability and environmental impact domain highlight the broader benefits, including energy recovery and greenhouse gas reduction, demonstrating how this integrated approach creates a circular solution that transforms problematic plastic waste into valuable liquid fuels while addressing environmental concerns and contributing to sustainable energy production.

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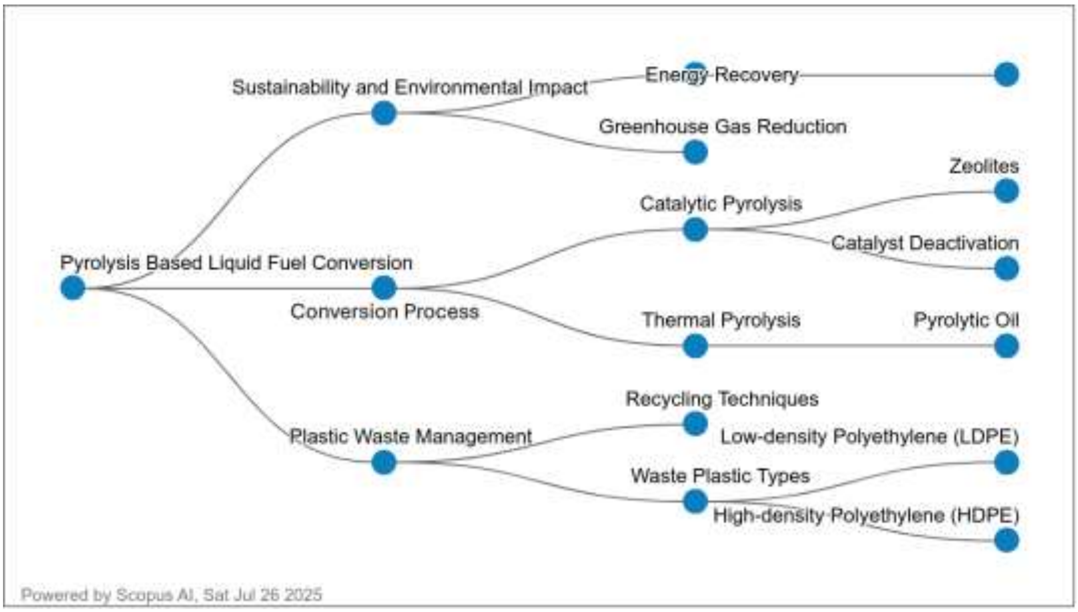

Figure 1: Concept Map for Pyrolysis Based Liquid Fuel Conversion from Plastic Waste
Source: Powered by Scopus AI, Sat Jul 26, 2025

Material and Methods

Identification

Important phases in the systematic review method were utilized in this research to gather a significant number of pertinent materials. Choosing keywords was the first step in the process. Next, thesauri, dictionaries, encyclopaedias, as well as past studies were used to find similar terms. Here, search strings for the Scopus as well as Web of Science (WoS) databases were constructed when all pertinent terms were found (see Table 2). 776 publications relevant to the study issue were found in the two databases during the systematic review's initial stage.

Table 2: The Search String

Scopus	TITLE-ABS-KEY (((polyethylene OR polypropylene) AND "waste plastic" AND pyrolysis AND (kinetics OR "reaction mechanism" OR "thermal degradation" OR catalyst OR vacuum))) AND (LIMIT-TO (SUBJAREA , "ENER") OR LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "CENG") OR LIMIT-TO (SUBJAREA , "CHEM") OR LIMIT-TO (SUBJAREA , "ENGI") OR LIMIT-TO (SUBJAREA , "MATE")) AND (LIMIT-TO (PUBYEAR , 2025)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")) Date of Access: August 2025
WoS	(polyethylene OR polypropylene) AND "waste plastic" AND pyrolysis AND (kinetics OR "reaction mechanism" OR "thermal degradation" OR catalyst OR vacuum) (Topic) and 2025 (Publication Years) and Article (Document Types) and English (Languages) and Engineering or Energy Fuels or Chemistry or Environmental Sciences Ecology or Materials Science or Science Technology Other Topics (Research Areas) Date of Access: August 2025

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Screening

The screening step is carried out during which prospective research items are screened to see whether they are aligned with the set research question or questions. This step usually focuses on the selection of research items with regard to the Pyrolysis-Based Liquid Fuel Conversion of Plastic Waste. At this step, duplicate papers are eliminated. After this exclusion, there were initially 704 publications that were removed, and 72 papers were selected to further investigate according to certain inclusion and exclusion criteria (see Table 3). Literature was the basis of the first criterion since it represents a primary source of practical recommendations, such as meta-syntheses, reviews, books, meta-analysis, chapters, book series, as well as conference proceedings that were not discussed throughout the latest study. In 2025, the review included only publications in the English language. All in all, ten publications were discarded because they were duplicates.

Table 3: The Selection Criterion of the Search

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2025	< 2025
Literature type	Journal (Article)	Conference, book, review
Publication stage	Final	In-press
Subject	Energy, Chemical Engineering, Chemistry, Engineering, Materials Science	Besides Energy, Chemical Engineering, Chemistry, Engineering, Materials Science

Eligibility

62 papers were ready for review in the third step, known as the eligibility phase. During this step, all the titles and key points of the articles were scrutinized to ensure that an article met the inclusion criteria and complemented the ongoing research goals. As a result, 36 data, papers, and articles were rejected since they were out of field, the titles were not pertinent to the study's goal, the abstracts were unrelated to it, and there was no full text access relying on empirical evidence. As a consequence, 26 articles remained for the next evaluation.

Data Abstraction and Analysis

An integrative analysis was utilized in this research as an assessment strategy to review and synthesise multiple research designs, especially those that involve quantitative methods. The primary aim was to determine key themes and subthemes. It was initiated by data collection that formed the background of theme development. As depicted in Figure 2, the authors conducted a thorough examination of 26 selected publications, extracting information and statements relevant to the focus of the study. They assessed the methodologies and findings of significant existing research on the plastic waste conversion turning into liquid fuel via pyrolysis. Following this, the authors collaborated to formulate themes grounded in the collected evidence. A log was kept through all the analysis to record interpretations, reflections, questions, and other insights related to the data. To ensure consistency in theme development, the authors made comparisons of their outcomes as well as discussed the differences through group discussions.

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The authors also compared the findings to resolve any discrepancies in the theme creation process. Note that if any inconsistencies on the themes arose, the authors address them with one another. Finally, the developed themes were tweaked to ensure their consistency. To ensure the validity of the problems, we developed three questions as follows below:

1. How do the structural and compositional properties of emerging catalysts influence the reaction pathways, selectivity, and efficiency of plastic waste pyrolysis?
2. What are the key kinetic parameters and reaction mechanisms governing the thermal and catalytic pyrolysis of mixed plastic waste, and how can process conditions be optimized to enhance conversion efficiency and product yield?
3. What are the performance characteristics, combustion behaviour, and environmental impacts of fuels derived from pyrolyzed plastic waste when applied in internal combustion engines?

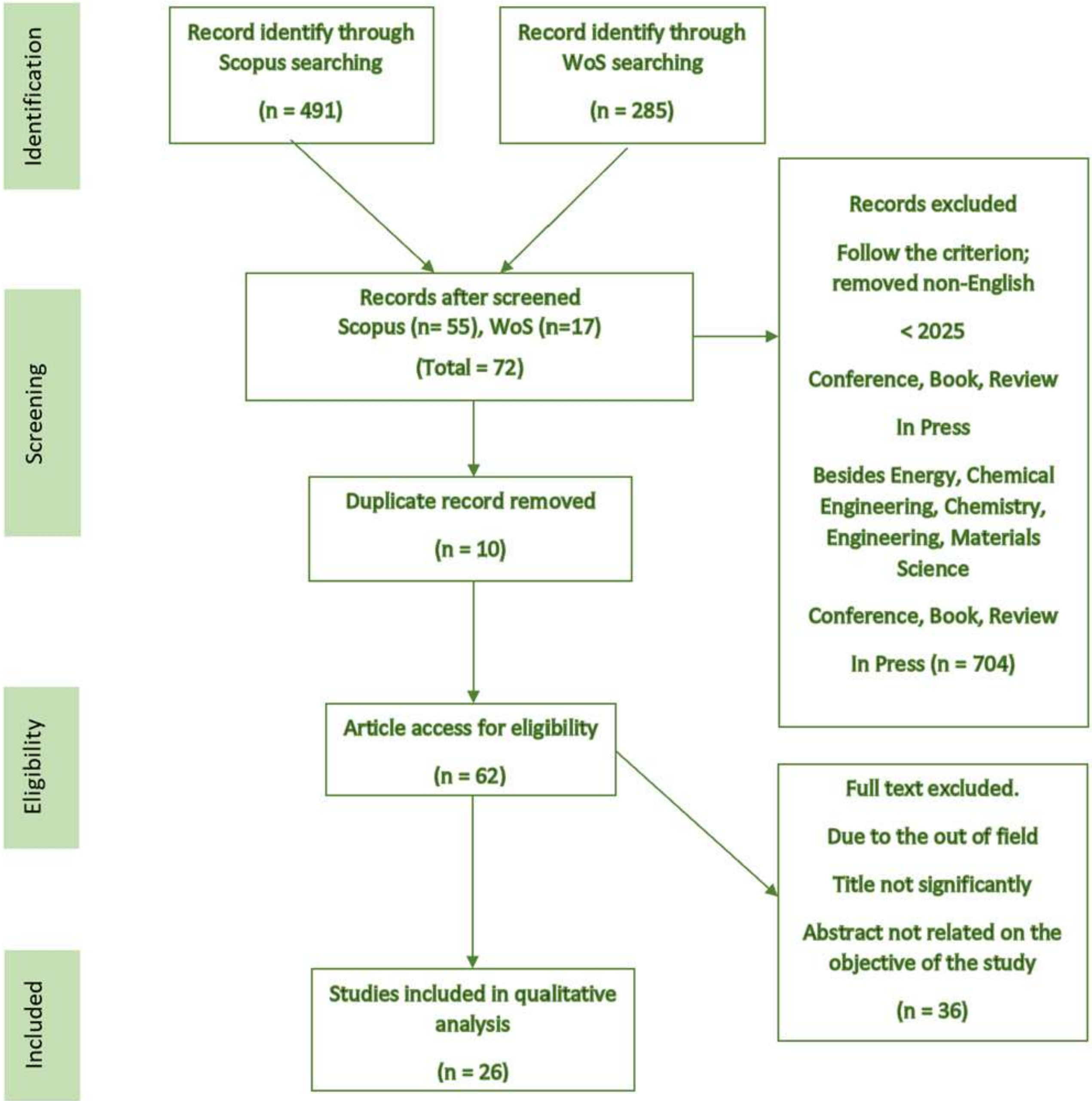

Figure 2: Flow Diagram of the Proposed Searching Study

Results and Discussion

Catalyst Development and Catalytic Mechanisms in Pyrolysis

The utilization of various catalytic systems in the pyrolysis of plastic waste has demonstrated significant effects on product selectivity and yield distribution. Research focusing on zeolite-based catalysts, such as HZSM-5, HY, and MCM-41, identified their effectiveness in converting polypropylene (PP) into gasoline-range hydrocarbons (Rahimi *et al.,* 2025). Investigations into self-assembled ZSM-5 nanozeolites from natural diatomite have further

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shown enhanced production of propylene, attributed to improvements in pore structure and acidity (Zhou *et al.,* 2025). Another approach using spherical zeolite catalysts improved pyrolysis efficiency and produced higher-quality liquid fuels due to better heat and mass transfer characteristics (Zeleke *et al.,* 2025). The results obtained prove the significance of control of morphology and certain acidic properties within the catalytic reactions of pyrolysis.

Other works used bimetallic and biochar-supported catalysts in determining the reaction path and production of the liquid product. Considering the trouble-free production of isoalkane-rich jet fuel fractions attributable to concomitant use of a Y-type zeolite in the activities of LDPE pyrolysis, the features and characteristics are interesting for aviation fuel purposes (Tang *et al.,* 2025). A similar study facilitated the effect of a biochar-supported Mg-Mo catalyst on enhancing the selectivity of jet-fuel-range hydrocarbons, where the positively charged basic sites and the negatively charged acidic sites act synergistically in catalytic conversion of LDPE (Kou *et al.,* 2025). Hydroprocessing was possible so that plastics were converted into diesel using a Mn/Zn-loaded activated carbon system, and demonstrated that redox-active metals had the potential to enhance hydrogenation and deoxygenation (Gacem et al., 2025). In such strategies, it is pointed out that chain length and saturation of hydrocarbons can be modified through the use of catalytic supports and metal additives.

Computational modelling and pre-treatment of pyrolysis reactions have also been used to increase mechanistic understanding of the reactions. Reactive molecular dynamics simulation helped to clarify the specifics of bond scission and the major reaction pathways of PP pyrolysis, as it should be used to design catalysts using molecular-level knowledge (Li *et al.,* 2025). Concurrently, non-thermal plasma pretreatment of HDPE leading to catalytic pyrolysis with 1Fe1Ni/γ-Al_2O_3 also yielded substantially improved results in terms of the production of hydrogen, insinuating that the structural rearrangement ascribed to non-thermal plasma can boost the relative efficiencies of succeeding cracking and dehydrogenation steps (Liu *et al.,* 2025). These papers exhibit the significance of using both experimental and simulation techniques in order to get a more in-depth knowledge of the catalytic performance and reaction mechanism.

Another level of study will be the effect of additives, feedstock complexity, as well as alternative sources of catalysts. The ability of fillers and pigments to disrupt the surface activity of catalysts in the plastic matrices was detected with particular interest in influential thermal degradation rates and product properties (Radhakrishnan *et al.,* 2025). Animal waste products, such as bone char catalysts in PP pyrolysis, have demonstrated the potential of sustainable catalysis as they have a high activity level, which is attributed to their porous nature and the calcium composition (Liu *et al.,* 2025). Also, the product production modelling of machine learning, how it could be applied to the zeolite-catalysed pyrolysis system, has allowed the predictability of product yield generation with such system adoption to structural and operational factors, providing new opportunities in catalyst development (Li *et al.,* 2025). Such discoveries are evidence of a larger trend toward using data to screen catalysts as well as embracing the use of inexpensive, renewable catalytic materials.

Process Optimization, Kinetics, and Mechanistic Studies

Recent investigations into the pyrolysis of plastic waste have focused extensively on revealing underlying mechanisms, optimizing process parameters, and advancing kinetic modelling to enhance product yields and energy efficiency. One notable study applied a hybrid simulation

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strategy involving large-scale reactive molecular dynamics and automatic reaction class prediction to investigate polypropylene pyrolysis. This work highlighted the significance of β-scission and homolytic cleavage as primary routes for generating short-chain hydrocarbons such as ethylene and propylene. Additionally, it identified temperature-dependent mechanisms responsible for the formation of polycyclic aromatic hydrocarbons like benzene, naphthalene, and anthracene, providing a comprehensive framework for modelling the progression of pyrolysis reactions at the molecular level The latest research on pyrolysis of plastic wastes has centred on the elucidation mechanisms, the refinements in process parameters and the promotion of kinetic modelling aiming at the product yields and process energy efficiencies. A typically interesting study employed a hybrid simulation approach; large-scale reactive molecular dynamics coupled with automated prediction of reaction classes to study polypropylene pyrolysis. This paper brought to the fore the importance of β-scission and homolytic cleavage as major pathways in the production of short-chain hydrocarbons like propene and ethylene. It further noted temperature-dependent processes that lead to the formation of polycyclic aromatic hydrocarbons such as naphthalene, benzene, as well as anthracene, and established a framework within which the development of reactions of pyrolysis can be modelled on a molecular scale (Li *et al.,* 2025). Likewise, co-pyrolysis of polyethylene or furfural residue used quick heating and artificial neural networks (ANNs) to investigate synergetic effects and changes in products distribution. Biomass plus polymer feed stock combination boosted hydrocarbon and inhibited oxygenated by products. These observations were supported by activation energies determined by Flynn–Wall–Ozawa and Kissinger–Akahira–Sunose methods, which indicated thermodynamic consistency of those results with the trends (Li *et al.,* 2025; Ezeokolie *et al.,* 2025; Dong *et al.,* 2025).

There has also been interest in energy and exergy analyses of pyrolysis systems in the quest towards finding ideal operating conditions. In one study involving pretreated single-use plastics, substantial gains in oil yield and energy recovery were noted post-treatment. Kinetic modelling via the Avrami–Erofeev model provided a better fit to the experimental decomposition data, revealing that pretreatment methods significantly influence process thermodynamics. Exergy efficiencies improved to over 70%, indicating better energy utilization from treated plastics (Bassey *et al.,* 2025). Another experimental and simulation-based assessment of medical plastic pyrolysis using Aspen Plus software demonstrated viable pathways for converting low-density polyethylene and polypropylene into fuel-grade pyrolytic oil, combustible gases, and solid char. Process separation stages and the impact of reactor temperature and pressure profiles were modelled, confirming experimental observations and emphasizing simulation's value in design optimization (Barot & Sharma, 2025; Pawar & Kim, 2025; Liu *et al.,* 2025).

The optimization of hydrogen-rich gas yields through catalytic fast pyrolysis has drawn growing interest. Through non-thermal plasma (NTP) pretreatment, high-density polyethylene exhibited increased light olefin production. When paired with a bimetallic Fe-Ni/γ-Al_2O_3 catalyst, the system achieved hydrogen yields nearing 92% of the hydrogen content in the feedstock. Density Functional Theory (DFT) simulations attributed this to the catalyst's capacity for C–H bond activation and favourable energetics for hydrogen evolution. This finding highlighted the efficiency of the combined additional chemical treatment as well ad the smart designs of a catalyst that helped to maximize the product making in a gas phase (Liu *et al.,* 2025; Ezeokolie *et al.,* 2025; Pawar & Kim, 2025).

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Artificial neural networks are examples of machine learning models that have been used to verify the results of the pyrolysis as well as conduct sensitivity analysis on the parameters of the process. The models demonstrated a high level of predictiveness between non-catalytic as well as catalytic systems with large values of R^2 and small values of mean squared error metrics. The most important findings were reaction temperature, which is followed by pressure, catalyst loading as well as duration of reaction. In the non-catalytic systems, the size of the particulates and the pyrolysis time were significant. The ANN technology was therefore offering a potent method in real time process optimization and forecasting of scenarios as well as tuning real-time processes (Ezeokolie *et al.,* 2025; Li *et al.,* 2025; Liu *et al.,* 2025).

There has also been an effort to attempt to address the environmental hazards that were attached with the byproducts of the process of pyrolysis. Co-pyrolysis between cellulose and polyethylene exposed high rates of commentary of polycyclic aromatic hydrocarbons at high temperatures. Incorporation of heteroatoms such as boron as well as nitrogen resulted in suppressing production of such harmful compounds by up to 99.7%. Such findings imply the importance of doping techniques and the choice of carrier gas to auxiliary optimization of pyrolysis pathways into safer and environmentally compliant products (Dong *et al.,* 2025; Li *et al.,* 2025; Barot & Sharma, 2025).

Fuel Production, Engine Application, and Environmental Assessment

Recent laboratory experiments have found that fuel like oils could indeed be made out of waste plastics through the use of thermal as well as catalytic pyrolysis. A comparison of thermal with catalytic methods of pyrolyzing the waste of polypropylene established that the latter was more efficient since it resulted in increases in oil products and decreases in char. The resulting oils also had physicochemical properties similar to diesel in favor of direct use of the oils in engines (Ezeokolie *et al.,* 2025). Similarly, the vacuum pyrolysis of mixed waste plastics with the addition of titanium and aluminum oxides enabled an increased calorific value of the final product fuel with a value of 11,950 cal/g. The altered reaction generated a reduced amount of liquid fuels as compared to the parent reaction because of others, but preferred higher energy content compounds, demonstrating trade-offs between yield and the fuel energy content (Nganda *et al.,* 2025). In support of these findings, a similar relative study of the catalytic and non-catalytic pyrolysis of polyethylene and polypropylene indicated oil yields of up to 73% depending on the presence of catalysts and that the hydrocarbon distribution was between C5 to C24- nearly matching the composition of petrol and diesel (Rahaman *et al.,* 2025).

Engine application studies of pyrolysis oils have yielded promising results in terms of performance and emission profiles. Blends of pyrolysis oil and gasoline in gasoline direct injection (GDi) spark-ignition engines demonstrated through testing that a 5% blend (B05) of the waste plastic oil (WPO) led to a higher brake thermal efficiency (BTE) than pure gasoline over a range of load conditions. Responses of cylinder pressure and exhaust temperature were also assigned; marginal variations were found compared to conventional fuels, which were optimized courtesy of the Taguchi technique (Kanchan *et al.,* 2025). Another experimental assessment employed diesel engine testing with blends of co-pyrolysis oil from mixed plastics and neem cake, where the addition of CeO_2 nanoparticles further improved combustion parameters. The combination of a 20% blend with 50 ppm CeO_2 additive yielded a 6% increase in thermal efficiency and notable reductions in CO and HC emissions—by approximately 30% and 6.2%, respectively (Livingston *et al.,* 2025). These outcomes suggest that co-pyrolysis-derived fuels can be improved further through the inclusion of biomass components and nanomaterial-based additives.

Breakdown of fuel characterization has been in the spotlight when it comes to judging the commercial viability of plastic-derived oils. Pyrolysis fuels made out of polypropylene, polyethylene, as well as mixed waste plastics were discovered to have values that were similar to those of diesel in terms of flash point, calorific values, pour point, and specific gravity. As an example, (Rahaman *et al.,* 2025) released calorific values of 35-41 MJ/kg and specific gravity of 0.73-0.82, which is quite close to that of petroleum-derived fuels. On the same note, (Kanchan *et al.,* 2025) affirmed the acceptability of WPO blends in gasoline to the internal combustion engines, and (Ezeokolie *et al.,* 2025) reported reduced degradation temperatures related to catalytic reactions leading to increased fuel yields as well as more effective thermal conversion. Besides, the vacuum pyrolysis technique employed by (Nganda *et al.,* 2025) has shown that the catalyst should make the fuel composition better off, even at low operational temperatures with low energy inputs by processing.

Environmental factors of fuel manufacture through pyrolysis have also been taken into consideration. Pyrolysis as a means of waste processing presents an option to incineration and burning since it produces fewer hazardous waste products. Catalysts were used to produce more fuel, and this also led to the degradation of plastics at a lower temperature, so that the total energy would be utilized less (Ezeokolie *et al.,* 2025; Kanchan *et al.,* 2025). Findings of the engine emissions showed that optimized blends have the ability to reduce CO and HC pollutant emissions, especially when blended with nanoparticles or in low percentages (Livingston *et al.,* 2025; Kanchan et al., 2025). In total, such findings support the multifunctionality of pyrolysis as an input in the cycle management of plastic waste as well as sustainable fuel.

Conclusion

This review summarizes the current scientific advances in the field of the pyrolysis-enhanced transformation of plastic waste into fuel in such a way that the argument is structured along three thematic areas. Firstly, Catalyst Development and Catalytic Mechanisms in Pyrolysis, underscores how advancements in catalyst synthesis, textural design, and active metal incorporation have substantially influenced reaction efficiency, selectivity towards desirable hydrocarbons, and overall energy demands. The second theme, Process optimization, Kinetics and Mechanism Studies, delivers the information that optimization of operation parameters, e.g., heating rate, thermal profile, vapor residence time, as well as refined development of kinetic models and mechanism studies, are major contributors in increasing liquid fuel yields with minimum by-products. The third theme, Fuel Production, Engine Application, and Environmental Assessment, shows that performance targets of upgraded pyrolysis-derived fuels can be equalized to their petroleum-based counterparts together with the fact that these sources also bring concrete environmental advantages, such as diverting waste as well as the reduction of possible emissions. When viewed together, these results once again establish pyrolysis as a promising, flexible technology on which to base plastic waste valorisation, and the importance of conductive research that connects catalytic innovation with implementation as well as fabrication into coherent systems capable of both processing and application.

Acknowledgements

The authors would like to acknowledge to Faculty of Mechanical and Manufacturing Engineering, Universiti Tun Hussein Onn Malaysia for its support.

Funding Statement
The authors did not receive support from any organization for the submitted work.

Conflict of Interest
The authors declare that they have no conflicts of interest to report regarding the present study.

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