ALMUSTOFA: Journal of Islamic Studies and Research
Vol. 03 , No. O2, Desember 2026 II Halaman: 227 – 241
e-ISSN: 3090-0247 II D.O.I. Jurnal: https://doi.org/10.23960/almustofa
https://ejournal.bamala.org/index.php/almustofa/index

Energy Transformation in the Qur'an: Reconstructing the First and Second Laws of Thermodynamics through Surah Yasin (36:80)

Reva Sri Wulandari [1], M Kharis Fadillah [2], Eka Linda Sari[3], Meilani Wardila[4], Bela Susanti[5], Hesti Winingsih[6]
[12345] Universitas Islam Negeri Raden Intan Lampung, [6]Universitas Islam Lampung
sriwulandarireva6@gmail.com,[1] mkharisfadillah@radenintan.ac.id,[2] ekalindasari808@gmail.com,[3] ismadila56gmail.com,[4] bellasusanti134@gmail.com,[5] hesti29.mk@gmail.com,[6]

Article History:
Received: 13/11/2026
Revised: 14/11/2026
Accepted: 14/11/2026

Keywords:
Energy Transformation; First Law Of Thermodynamics; Second Law Of Thermodynamics; Photosynthesis

Abstract: *This study examines the relationship between Surah Yasin (36:80) and the principles of energy transformation in thermodynamics, particularly the First and Second Laws, and explores its potential as enrichment material for secondary physics education. Using a qualitative library research design, the study analyzes Qur'anic interpretation alongside scientific literature on photosynthesis, biomass, combustion, and thermodynamic principles. The findings indicate that the phenomenon of fire originating from a green tree provides a meaningful context for understanding the transformation of solar energy into chemical energy through photosynthesis and the subsequent release of energy through biomass combustion. This process illustrates the First Law of Thermodynamics, which explains the conservation of energy during its transformation, and the Second Law, which accounts for the irreversible nature of combustion and the generation of entropy in the system and its surroundings. The study further identifies the educational potential of this Qur'anic context for connecting scientific reasoning with Islamic reflection in thermodynamics learning. It proposes a conceptual approach that integrates Qur'anic contextualization, scientific exploration, thermodynamic understanding, and spiritual reflection. Rather than treating the Qur'an as a source of scientific formulas, this approach positions the verse as a starting point for meaningful dialogue between revelation and empirical knowledge. As a conceptual study, its proposed educational approach requires further development and empirical evaluation.*

INTRODUCTION

The relationship between religion and science remains an important issue in contemporary education, particularly in Islamic educational institutions. The separation between religious knowledge and modern scientific disciplines has often limited opportunities to develop a more comprehensive understanding of knowledge. In Islamic thought, however, the Qur'an encourages humans to observe, reflect upon, and understand the natural world as part of their intellectual and spiritual responsibilities. This perspective provides a foundation for connecting Qur'anic reflection with scientific inquiry without eliminating the distinctive methods and principles of each discipline. Al-Attas (1993) emphasizes the importance of integrating knowledge within an Islamic worldview, while Al-Faruqi (1982) argues that the development of knowledge should be informed by Islamic intellectual and ethical foundations. In science education, such integration requires a careful dialogue between students' cultural and religious

backgrounds and the empirical character of scientific knowledge (Aikenhead & Jegede, 1999; Cobern & Aikenhead, 1998).

One Qur'anic passage that provides an interesting context for this dialogue is Surah Yasin (36:80), which states that God has made fire available to humans from a green tree, enabling them to kindle fire from it. The verse appears within a broader discussion of divine power and the possibility of resurrection. It invites reflection on the relationship between apparently contrasting natural conditions, particularly the green tree and the fire that can be obtained from it. Classical interpretations, including those of al-Tabari and Ibn Kathir, discuss the verse in relation to the emergence of fire from trees and the divine power to create contrasting conditions. Ibn Kathir also records the traditional explanation involving two particular trees, al-marakh and al-'afar, whose branches could be rubbed together to produce fire (Ibn Kathir, n.d.; al-Tabari, n.d.). These interpretations indicate that the primary theological emphasis of the verse concerns divine power, rather than the direct presentation of a modern scientific theory.

Nevertheless, the phenomenon described in the verse provides a meaningful starting point for examining energy transformation. From a scientific perspective, green plants capture solar radiation through photosynthesis and convert part of this energy into chemical energy stored in organic compounds. These compounds become part of plant biomass, including wood and other structural materials. When biomass undergoes combustion, its chemical constituents react with oxygen and release energy, primarily as heat and light. The characteristics of biomass combustion depend on factors such as chemical composition, moisture content, and combustion conditions (Jenkins et al., 1998; McKendry, 2002). This relationship provides an opportunity to discuss the transformation of solar energy into chemical energy and its subsequent release during combustion. However, it is important to distinguish the scientific explanation from the verse's interpretive meaning. The Qur'anic expression should not be treated as an explicit description of the biochemical mechanisms of photosynthesis or modern combustion chemistry.

The phenomenon also provides a relevant context for understanding the First Law of Thermodynamics. This law establishes that energy is conserved, although it can be transferred or transformed between different forms. In a thermodynamic system, the change in internal energy is determined by the heat transferred to the system and the work performed by or on the system, depending on the adopted sign convention (Moran et al., 2018; Çengel & Boles, 2015). In the context of biomass, energy initially stored in organic compounds can be released through chemical reactions during combustion. This process illustrates energy transformation rather than the creation of energy from nothing. The distinction between energy stored in chemical bonds and energy transferred to the surroundings is therefore essential for explaining the scientific relevance of Surah Yasin (36:80).

Beyond energy conservation, combustion also provides a context for discussing the Second Law of Thermodynamics. Whereas the First Law explains the conservation of energy, the Second Law concerns the direction of spontaneous processes and the increase in total entropy. Combustion is an irreversible process in which chemical energy is transformed and dispersed through heat transfer, radiation, and the formation of reaction products. Its thermodynamic analysis requires consideration of both the system and its surroundings, rather than assuming that the entropy of the reacting material must always increase independently. This distinction is important because entropy change depends on the defined system boundary and the overall process (Atkins & de Paula, 2014; Moran et al., 2018). Consequently, the burning of biomass can be used to introduce students to energy conservation, irreversibility, and entropy generation through an observable natural phenomenon.

Despite the potential of Qur'anic integration in physics education, the relationship between scriptural interpretation and scientific concepts requires further conceptual development. Previous studies have explored the integration of Qur'anic verses into physics teaching materials, particularly in temperature and heat. Haris et al. (2021), for example, developed a REACT-based physics module integrating Qur'anic content into temperature and heat learning. More recently, Ningsi et al. (2025) developed an instructional module integrating Qur'anic verses into temperature and heat materials for secondary education. Meiliyadi et al. (2025) also examined the integration of Islamic perspectives and the First Law of Thermodynamics in physics learning. These studies demonstrate growing interest in connecting Islamic values with physics instruction.

However, the discussion can be extended beyond the development and validation of instructional materials. There remains a need for a more systematic conceptual analysis that connects the interpretation of Surah Yasin (36:80), the scientific process of energy transformation, and the thermodynamic principles governing combustion. In particular, the relationship between the First and Second Laws of Thermodynamics needs to be explained within a coherent framework that distinguishes energy conservation from entropy generation. Furthermore, the educational implications of this relationship require attention so that Qur'anic integration does not become merely the inclusion of religious quotations in physics materials. Instead, it should support students in understanding scientific processes while developing a reflective appreciation of the natural world.

Addressing this concern, the present study aims to reconstruct the relationship between Surah Yasin (36:80) and the First and Second Laws of Thermodynamics through a qualitative literature-based analysis. Specifically, it examines the Qur'anic interpretation of the verse, analyzes the transformation of energy from photosynthesis to biomass combustion, and explores

the relevance of energy conservation and entropy generation to the phenomenon. It also considers how this conceptual relationship can be developed as enrichment material for secondary-school physics education. The study seeks to contribute a more careful framework for integrating Qur'anic reflection and thermodynamic understanding, maintaining the distinction between theological interpretation and empirical scientific explanation while bringing them into a meaningful educational dialogue.

RESEARCH METHODOLOGY

This study employed a qualitative library research design using an integrative literature review and conceptual analysis. This approach was selected because the research examines the relationship between the Qur'anic interpretation of Surah Yasin (36:80) and established scientific concepts of energy transformation, combustion, and the First and Second Laws of Thermodynamics. Rather than collecting empirical data from classroom experiments, the study analyzes relevant textual and scientific sources to develop a coherent conceptual understanding. An integrative review is appropriate for this purpose because it enables researchers to critically examine literature from different disciplines and synthesize their perspectives into a conceptual framework (Snyder, 2019; Torraco, 2005; Whittemore & Knafl, 2005).

The sources consisted of primary and secondary literature. Primary sources included Surah Yasin (36:80), its translation, and selected Qur'anic interpretations, particularly those discussing the expression *asy-syajaril-akhdhar* (the green tree) and the phenomenon of fire. The study considered classical and contemporary interpretations to understand the theological context of the verse and avoid reducing its meaning to a modern scientific explanation. Secondary sources included academic books and journal articles addressing photosynthesis, biomass composition, chemical energy, combustion, exothermic reactions, thermodynamic systems, energy conservation, and entropy. Relevant publications on the integration of Islamic values and science education were also examined to establish the educational context of the study.

The literature was selected purposively according to its relevance to the research objectives, academic credibility, and contribution to the conceptual discussion. Priority was given to recognized Qur'anic interpretations, established physics and chemistry textbooks, peer-reviewed journal articles, and scholarly publications related to Islamic science education. Sources that contained unsupported scientific claims, unclear bibliographic information, or interpretations that could not be adequately connected to the research questions were not used as the basis for the main analysis. This selection process followed the principle that documentary materials must be evaluated critically in terms of their relevance, origin, purpose, and contribution to the research problem (Bowen, 2009).

Data were collected through documentation by identifying, reading, reviewing, and recording relevant information from the selected sources (M. Mahbubi, 2025/2025). The analysis proceeded through four interconnected stages. First, the researchers examined the textual and interpretive dimensions of Surah Yasin (36:80), focusing on its theological context and the meaning of the green tree and fire. Second, relevant scientific concepts were identified, particularly the conversion of solar energy into chemical energy through photosynthesis and the release of energy during biomass combustion. Third, these concepts were critically compared with the First Law of Thermodynamics, concerning energy conservation, and the Second Law, concerning entropy generation and the irreversibility of spontaneous processes. Fourth, the resulting synthesis was used to formulate implications for physics enrichment at the secondary-school level.

The analysis combined qualitative content analysis and thematic synthesis. Content analysis was used to identify relevant meanings and scientific concepts within the selected documents, while thematic synthesis helped organize the findings into broader conceptual relationships (Braun & Clarke, 2006; Hsieh & Shannon, 2005; Thomas & Harden, 2008). Throughout the process, the researchers maintained a distinction between Qur'anic interpretation, empirical scientific explanation, and pedagogical reflection. This distinction was essential to prevent forced scientific interpretations of the verse. The final synthesis was intended to produce a conceptual reconstruction rather than an empirical claim about instructional effectiveness, consistent with the objectives of integrative literature-based research (Snyder, 2019; Torraco, 2005).

HASIL DAN PEMBAHASAN

The Qur'anic Meaning of Green Trees and Fire: Interpreting Surah Yasin (36:80) in the Context of Natural Phenomena

Surah Yasin (36:80) states: *"He is the One who produces fire for you from the green tree, and from it you kindle fire."* This verse presents a natural phenomenon that invites reflection on the relationship between seemingly contrasting elements: a green tree, commonly associated with water, moisture, and life, and fire, which is associated with heat, dryness, and combustion. Within the broader context of Surah Yasin, this phenomenon is not presented merely as a description of the natural world. Rather, it forms part of an argument concerning God's power to recreate human beings after death. The verse therefore combines a reference to an observable phenomenon with a theological argument about divine creation and resurrection.

The expression *al-shajar al-akhdar* (the green tree) is central to understanding the verse. The phrase *ja'ala lakum min al-shajar al-akhdar naran* indicates that fire is made available to

human beings through trees. The following expression, *fa-idha antum minhu tuqidun*, emphasizes the human ability to kindle fire from this natural source. The verse thus directs attention to a familiar human experience: obtaining fire from wood. However, its significance extends beyond the practical use of trees as fuel. It invites reflection on the divine power that enables different natural properties and processes to exist within the same created order.

Classical Qur'anic commentators generally explain this verse through the relationship between green trees and the production of fire. Al-Tabari (n.d.) interprets the verse as evidence that the God who brings fire from green trees is also capable of restoring human beings after their bodies have decayed. His interpretation places the phenomenon within the argument for resurrection developed in the surrounding verses. Similarly, Ibn Kathir (n.d.) explains that the tree initially grows green and fresh before eventually becoming dry wood that can be used to kindle fire. This transformation illustrates God's power to create different conditions from the same natural substance. Al-Qurtubi (n.d.) also emphasizes the contrast between the moisture of green wood and the heat of fire, presenting this contrast as evidence of divine omnipotence. These interpretations demonstrate that the central concern of the verse is not the formulation of a physical theory but the recognition of God's creative power through observable natural phenomena.

An important aspect of classical interpretation concerns the identification of two particular trees, *al-marakh* and *al-'afar*. According to reports discussed by Ibn Kathir (n.d.), al-Qurtubi (n.d.), and al-Baghawi (n.d.), these trees were traditionally used by Arabs to produce fire by rubbing two branches against each other. The branches were described as green and moist, yet friction between them could produce sparks and eventually fire. Al-Sa'di (n.d.) similarly highlights the apparent contrast between the moisture of the green tree and the dryness and heat associated with fire. This interpretation provides a historical and practical context for understanding how the verse would have been meaningful to its original audience. It also demonstrates that the expression “green tree” should not automatically be restricted to the modern scientific concept of photosynthesis.

Contemporary discussions of *tafsir ilmi* have expanded the interpretation by examining the relationship between the verse and scientific knowledge about plants. Tantawi Jawhari, in *Al-Jawahir fi Tafsir al-Qur'an al-Karim*, represents an important development in scientific Qur'anic interpretation through his extensive engagement with natural phenomena and scientific explanations (Jawhari, 1932). Lestari (2021), in her comparative study of Fakhr al-Din al-Razi and Tantawi Jawhari, identifies differences in their approaches to interpreting Surah Yasin (36:80). While al-Razi emphasizes theological reasoning and analogy, Jawhari gives greater attention to scientific explanations, including processes associated with green plants. This

difference illustrates that a single Qur'anic verse can be examined through different interpretive approaches without assuming that all interpretations have identical purposes or epistemological foundations.

A related discussion appears in the collaborative work *Tumbuhan dalam Perspektif Al-Qur'an dan Sains*, published by the Indonesian Ministry of Religious Affairs. This work examines Qur'anic references to plants through dialogue between Qur'anic scholarship and scientific knowledge (Lajnah Pentashihan Mushaf Al-Qur'an, 2011). In its discussion of green plants, the scientific perspective provides an opportunity to consider photosynthesis, the role of chlorophyll, and the production of organic substances through the use of light energy. Mulyawan et al. (2024) also compare the interpretation of Surah Yasin (36:80) in Jawhari's *Al-Jawahir* and the Ministry's scientific commentary. Their discussion identifies two interpretive emphases: the traditional explanation involving al-marakh and al-'afar, and the scientific explanation that relates green plants to photosynthesis. These perspectives provide complementary contexts for understanding the verse, although they should not be treated as scientifically or exegetically identical.

From a scientific perspective, photosynthesis explains how green plants capture light energy and convert it into chemical energy stored in organic compounds. This process provides an important scientific context for understanding the role of green plants in energy transformation. Nevertheless, the presence of this scientific explanation does not mean that the verse explicitly describes the biochemical stages of photosynthesis. The Qur'anic expression refers to fire obtained from green trees, while photosynthesis is a scientific explanation developed through empirical observation and experimentation. The relationship between them is therefore interpretive and reflective rather than a direct equivalence between scriptural wording and a modern scientific formula. This distinction is important to prevent scientific concepts from being imposed on the text beyond what its language and exegetical context support.

The broader context of verses 77–83 also reinforces this interpretation. In these verses, the Qur'an responds to the denial of resurrection by directing attention to the creation of human beings, the creation of the heavens and the earth, and the production of fire from trees. Al-Tabari (n.d.) and Ibn Kathir (n.d.) explain that the example of fire from green trees functions as an argument that the Creator who brings something from an apparently contrasting condition is capable of recreating human beings. Al-Razi's theological discussion, as examined by Lestari (2021), further illustrates how the verse can be understood through reasoning about divine power and the relationship between apparently opposing conditions. Shihab (2002) also emphasizes the importance of understanding Qur'anic expressions in relation to their textual

context and broader messages. Consequently, the scientific discussion should remain connected to the verse's primary theological purpose rather than displacing it.

This approach is consistent with the broader discussion of the relationship between Islamic knowledge and modern science. Al-Attas (1993) emphasizes the importance of examining knowledge through an Islamic worldview, while Al-Dhahabi (2005) discusses the methodological considerations involved in Qur'anic interpretation. Baidan (2005) likewise underlines the importance of interpretive methods and the principles governing the understanding of Qur'anic texts. In science education, Cobern and Aikenhead (1998) and Aikenhead and Jegede (1999) demonstrate that scientific learning is influenced by cultural and worldview contexts. Their perspectives provide a useful basis for considering how Qur'anic reflection can enrich the learning of natural phenomena without compromising the empirical foundations of scientific knowledge.

Accordingly, Surah Yasin (36:80) can be understood through three connected dimensions: its theological message concerning divine power and resurrection, its historical interpretation concerning the use of green trees to produce fire, and its potential to stimulate scientific reflection on natural processes. These dimensions should remain connected but conceptually distinguishable. The verse provides a Qur'anic framework for reflection, classical and contemporary tafsir clarify its interpretive meanings, and scientific knowledge explains the physical and biological processes associated with plants and fire. This distinction establishes a sound foundation for the subsequent discussion of photosynthesis, biomass, combustion, and the laws of thermodynamics. Rather than presenting the Qur'an as a textbook of physics, this study approaches the verse as a starting point for integrating textual understanding, scientific investigation, and reflection on the order of creation.

From Solar Energy to Thermal Energy: Reconstructing Energy Conservation and Entropy through Photosynthesis and Combustion

The scientific significance of the natural phenomenon described in Surah Yasin (36:80) can be further explored through the transformation of energy in green plants and the subsequent combustion of their biomass. Although the verse does not explicitly formulate the laws of thermodynamics, the phenomenon of obtaining fire from trees provides a meaningful context for examining how energy is captured, stored, and released through natural processes. From a scientific perspective, this process involves two interconnected stages: the conversion of solar radiation into chemical energy through photosynthesis and the release of stored chemical energy through combustion. These stages provide a conceptual basis for discussing energy conservation and entropy generation within the framework of the First and Second Laws of Thermodynamics.

Photosynthesis is the primary biological process through which green plants capture solar energy and convert it into chemical energy. Chlorophyll and other photosynthetic pigments absorb light, initiating a series of photochemical reactions that ultimately support the synthesis of energy-rich organic compounds. In simplified form, the overall process can be represented as follows:

$$6CO_2 + 6H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$$

This equation illustrates that carbon dioxide and water are converted into carbohydrates through a process driven by light energy. The energy absorbed from sunlight is not simply stored as heat; rather, it becomes part of the chemical energy associated with organic molecules. Taiz et al. (2015) explain that photosynthesis involves light-dependent reactions and carbon assimilation processes through which plants convert light energy into chemical forms. Blankenship (2014) similarly describes photosynthesis as a fundamental biological mechanism for converting solar energy into chemical energy. These processes establish the energetic foundation of plant growth and biomass production.

The energy captured through photosynthesis becomes incorporated into different organic components of plant tissues, including carbohydrates, cellulose, and lignin. These compounds contribute to the structural development of stems, branches, and other plant parts. Biomass therefore represents an important form of stored chemical energy originating from solar radiation. McKendry (2002) identifies biomass as an energy resource derived from biological materials and explains its potential for conversion into useful energy. Jenkins et al. (1998) also demonstrate that biomass has different combustion characteristics depending on its chemical composition, moisture content, and inorganic constituents. Consequently, wood is not merely a physical material obtained from trees; it is also a chemical energy carrier produced through biological processes.

The second stage occurs when wood undergoes combustion. Combustion is an oxidation reaction in which combustible substances react with oxygen and release energy. In the case of wood, its principal combustible components contain carbon and hydrogen, which react with oxygen to produce carbon dioxide, water vapour, and other products depending on combustion conditions. A simplified representation of the complete oxidation of cellulose is:

$$(C_6H_{10}O_5)n + 6nO_2 \rightarrow 6nCO_2 + 5nH_2O + \text{energy}$$

This reaction illustrates the release of chemical energy in the form of heat and light. The process is exothermic because the energy released through the formation of products exceeds the energy required to initiate and sustain the chemical reaction. Turns (2012) explains that combustion involves chemical reactions accompanied by heat release, while Moran et al. (2018) discuss combustion as an energy-conversion process that can be analysed through

thermodynamic principles. Therefore, the fire obtained from wood can be understood as the release of chemical energy that was previously stored in plant biomass.

An important qualification concerns the moisture content of green wood. Although Surah Yasin (36:80) refers to fire originating from a green tree, this does not mean that freshly cut, water-rich wood is necessarily easier to ignite than dry wood. In practical combustion, moisture must first be heated and evaporated, requiring additional energy before sustained ignition can occur. The presence of excessive moisture may therefore reduce combustion efficiency and delay ignition (Jenkins et al., 1998; McKendry, 2002). The scientific explanation should distinguish between the green tree as the biological origin of combustible biomass and the actual condition of wood when it is burned. This distinction prevents an inaccurate interpretation of the verse as a claim that wet wood burns more easily than dry wood.

The sequence from photosynthesis to combustion provides a useful context for understanding the First Law of Thermodynamics. This law states that energy cannot be created or destroyed, although it can be transferred between a system and its surroundings or transformed from one form into another. For a closed system, a commonly used expression is:

$$\Delta U = Q - W$$

In this equation, ΔU represents the change in the internal energy of the system, Q represents heat transferred into the system, and W represents work performed by the system on its surroundings. This sign convention follows the engineering formulation discussed by Moran et al. (2018) and Çengel and Boles (2015). Applied to the phenomenon of wood combustion, the principle indicates that the chemical energy released during oxidation does not disappear. Instead, energy is transferred to the surroundings through heat and radiation, while some energy may also be associated with the movement and expansion of combustion gases. The energy balance must account for all relevant transfers and changes in stored energy.

The complete energy pathway can therefore be conceptualised as solar radiation being captured during photosynthesis, converted into chemical energy, stored in plant biomass, and subsequently released through combustion as heat and light. This pathway illustrates energy transformation rather than the creation of energy from nothing. However, it is important to recognise that the First Law does not establish that all the original solar energy can be recovered as useful heat. Some energy remains distributed among the combustion products and surroundings, and the amount of recoverable energy depends on the system boundary and operating conditions. This distinction is essential for an accurate thermodynamic interpretation (Moran et al., 2018).

While the First Law explains the conservation of energy, the Second Law explains the direction and limitations of energy transformations. In real processes, energy conversion is

accompanied by irreversibility and entropy generation. Entropy is a thermodynamic property that helps describe the direction of spontaneous processes and the extent to which energy becomes dispersed. According to the Second Law, the total entropy of an isolated system cannot decrease during a real process; it increases in irreversible processes and remains constant in an ideal reversible process (Atkins & de Paula, 2014; Çengel & Boles, 2015). Thus, energy conservation does not imply that all forms of energy remain equally available to perform useful work.

Wood combustion provides a clear example of this principle. During combustion, the chemical structure of biomass is transformed into products such as carbon dioxide, water vapour, and ash, accompanied by the release of heat. The released thermal energy is transferred to the surrounding environment, generally from regions of higher temperature to regions of lower temperature. This transfer is spontaneous and irreversible under ordinary conditions. The resulting entropy generation occurs through chemical reactions, heat transfer across finite temperature differences, and other dissipative processes. Consequently, the entropy of the wood and its immediate system boundary does not necessarily increase at every stage; the relevant thermodynamic conclusion concerns the total entropy change of the system and its surroundings. This interpretation is consistent with the treatment of irreversibility and entropy generation in classical thermodynamics (Moran et al., 2018; Klein & Nellis, 2012).

The relationship between the two laws can be summarised through the distinction between energy quantity and energy quality. The First Law establishes that the total energy is conserved, whereas the Second Law explains why the capacity of energy to produce useful work decreases in real processes. During wood combustion, chemical energy is converted into heat and light, but the released energy becomes progressively dispersed into the environment. This does not mean that energy is destroyed; rather, its availability for further useful work is reduced. Bejan (2016) explains that thermodynamic analysis must therefore consider not only energy balances but also irreversibility and the quality of energy.

Taken together, photosynthesis and combustion provide a scientifically meaningful framework for reflecting on the natural phenomenon presented in Surah Yasin (36:80). The verse offers a Qur'anic context for considering the relationship between green plants and fire, while biology and thermodynamics explain the mechanisms through which solar energy is stored in biomass and released through oxidation. The First Law clarifies the conservation of energy throughout this transformation, while the Second Law explains the irreversible character of combustion and the generation of entropy. The relationship should not be understood as evidence that the Qur'an explicitly states modern thermodynamic equations. Rather, it demonstrates how a Qur'anic reflection on natural phenomena can become an intellectual

starting point for examining established scientific principles. This reconstruction provides the scientific foundation for developing a more integrative approach to thermodynamics education.

CONCLUSION

This study has examined the relationship between Surah Yasin (36:80) and the scientific principles of energy transformation, particularly the First and Second Laws of Thermodynamics. The analysis demonstrates that the Qur'anic description of fire originating from a green tree provides a meaningful context for reflecting on natural phenomena and the power of creation. Classical interpretations emphasize the theological significance of this phenomenon as evidence of God's ability to create contrasting natural conditions and to resurrect human beings. Contemporary scientific perspectives further provide opportunities to explore the relationship between green plants, biomass, and energy transformation. Nevertheless, the Qur'anic message and modern scientific explanations represent distinct but complementary domains of understanding.

From a scientific perspective, the relationship between green plants and fire can be explained through the transformation of solar energy into chemical energy during photosynthesis and the subsequent release of stored energy through biomass combustion. This process illustrates the First Law of Thermodynamics, which establishes the conservation of energy throughout its transformation. At the same time, combustion provides an example of the Second Law of Thermodynamics through its irreversible nature and the generation of entropy in the system and its surroundings. These principles demonstrate that energy is conserved in quantity, although its capacity to perform useful work changes during real processes. The relationship between the two laws therefore offers a deeper understanding of the natural phenomenon discussed in the verse.

The study also highlights the educational potential of Surah Yasin (36:80) as contextual enrichment material for teaching thermodynamics at the secondary-school level. The verse can serve as an entry point for connecting Qur'anic reflection with scientific exploration of photosynthesis, biomass, combustion, energy conservation, and entropy. Such an approach may encourage students to develop scientific reasoning while reflecting on the relationship between natural phenomena and Islamic values. Importantly, the integration of Qur'anic perspectives should not reduce the sacred text to a source of scientific formulas or impose scientific interpretations beyond the meaning supported by Qur'anic exegesis. Instead, it should establish a constructive dialogue between revelation, empirical knowledge, and educational reflection.

The main contribution of this study is its conceptual reconstruction of Surah Yasin (36:80) through the interconnected perspectives of energy transformation, thermodynamic principles, and Islamic physics education. It extends the discussion beyond the identification of general relationships between Qur'anic verses and physics concepts by connecting photosynthesis and biomass combustion to both the First and Second Laws of Thermodynamics. However, as a qualitative library-based study, its findings remain conceptual and have not been empirically tested in classroom settings. Future research should therefore develop teaching modules or student worksheets based on this framework and investigate their validity, practicality, and effectiveness in supporting students' conceptual understanding and reflective engagement with science and Islamic values.

DAFTAR PUSTAKA

Aikenhead, G. S., & Jegede, O. J. (1999). Cross-cultural science education: A cognitive explanation of a cultural phenomenon. *Journal of Research in Science Teaching, 36*(3), 269–287.

Al-Attas, S. M. N. (1993). *Islam and secularism*. International Institute of Islamic Thought and Civilization.

Al-Baghawi, A. M. (n.d.). *Ma'alim al-tanzil fi tafsir al-Qur'an*. [Edition and publisher details to be completed according to the copy consulted].

Al-Dhahabi, M. H. (2005). *Al-tafsir wa al-mufassirun*. Dar al-Hadith.

Al-Qurtubi, M. A. (n.d.). *Al-jami' li ahkam al-Qur'an*. [Edition and publisher details to be completed according to the copy consulted].

Al-Sa'di, A. R. (n.d.). *Taysir al-karim al-rahman fi tafsir kalam al-mannan*. [Edition and publisher details to be completed according to the copy consulted].

Al-Tabari, M. J. (n.d.). *Jami' al-bayan 'an ta'wil ay al-Qur'an*. [Edition and publisher details to be completed according to the copy consulted].

Atkins, P., & de Paula, J. (2014). *Atkins' physical chemistry* (10th ed.). Oxford University Press.

Baidan, N. (2005). *Wawasan baru ilmu tafsir*. Pustaka Pelajar.

Bejan, A. (2016). *Advanced engineering thermodynamics* (4th ed.). Wiley.

Blankenship, R. E. (2014). *Molecular mechanisms of photosynthesis* (2nd ed.). Wiley-Blackwell.

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27–40. https://doi.org/10.3316/QRJ0902027

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Çengel, Y. A., & Boles, M. A. (2015). *Thermodynamics: An engineering approach* (8th ed.). McGraw-Hill Education.

Cobern, W. W., & Aikenhead, G. S. (1998). Cultural aspects of learning science. In B. J. Fraser & K. G. Tobin (Eds.), *International handbook of science education* (pp. 39–52). Kluwer Academic Publishers.

Fahimah, S., & Lestari, D. A. (2023). Al-Jawahir fi Tafsiril Al-Qur'anil Karim karya Tanthawi Jauhari: Kajian tafsir ilmi. *Al Furqan: Jurnal Ilmu Al Quran dan Tafsir, 6*(1), 136–149. https://doi.org/10.58518/alfurqon.v6i1.1779

Fitriyawany, Arusman, & Putri, M. (2025). Development of REACT-based module integrating Qurani in temperature and heat materials in high school. *IMPULSE: Journal of Research and Innovation in Physics Education, 5*(2), 84–99. https://doi.org/10.14421/impulse.2025.52-01

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Ibn Kathir, I. (n.d.). *Tafsir al-Qur'an al-'azim*. [Edition and publisher details to be completed according to the copy consulted].

Jenkins, B. M., Baxter, L. L., Miles, T. R., Jr., & Miles, T. R. (1998). Combustion properties of biomass. *Fuel Processing Technology, 54*(1–3), 17–46. https://doi.org/10.1016/S0378-3820(97)00059-3

Jawhari, T. (1932). *Al-Jawahir fi tafsir al-Qur'an al-karim*. Mustafa al-Babi al-Halabi. [Verify the year and edition against the copy consulted].

Klein, S. A., & Nellis, G. F. (2012). *Thermodynamics*. Cambridge University Press.

Lajnah Pentashihan Mushaf Al-Qur'an. (2011). *Tumbuhan dalam perspektif Al-Qur'an dan sains*. Kementerian Agama Republik Indonesia.

Lestari, M. Y. (2021). *Implementasi corak ilmi pada penafsiran Surah Yasin ayat 80 (studi muqaran Tafsir ar-Razi dan Thantawi Jawhari)* [Undergraduate thesis, Universitas Islam Negeri Sultan Syarif Kasim Riau]. Repository UIN Sultan Syarif Kasim Riau. https://repository.uin-suska.ac.id/57189/

McKendry, P. (2002). Energy production from biomass (Part 1): Overview of biomass. *Bioresource Technology, 83*(1), 37–46. https://doi.org/10.1016/S0960-8524(01)00118-3

Moran, M. J., Shapiro, H. N., Boettner, D. D., & Bailey, M. B. (2018). *Fundamentals of engineering thermodynamics* (9th ed.). Wiley.

Mulyawan, A., Achmad, Y., Lubis, Z. H., & Kamaluddin, A. (2024). Tafsir Surat Yasin ayat 80 (studi komparasi Tafsir Al-Jawâhir fî Tafsîr Al-Qur'ân Al-Karîm dan Tafsir Ilmi Kemenag RI). *Edukasi Terkini: Jurnal Pendidikan Modern, 6*(4). https://journalversa.com/s/index.php/jpm/article/view/3236

Ningsi, R. W., Hasbullah, H., & Qaddafi, M. (2025). The development of a physics instructional module on temperature and heat with integration of Quranic verses. *JPF (Jurnal Pendidikan Fisika) Universitas Islam Negeri Alauddin Makassar, 13*(1), 90–97. https://doi.org/10.24252/jpf.v13i1.57963

Nuryantini, A. Y., Karman, & Holik, A. (2018). Integration science and religion in physic subject: An analysis in Islamic higher education. *TARBIYA: Journal of Education in Muslim Society, 5*(1), 11–18. https://doi.org/10.15408/tjems.v5i1.9508

Shihab, M. Q. (2002). *Tafsir Al-Mishbah: Pesan, kesan, dan keserasian Al-Qur'an*. Lentera Hati.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2015). *Plant physiology and development* (6th ed.). Sinauer Associates.

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology, 8*, Article 45. https://doi.org/10.1186/1471-2288-8-45

Torraco, R. J. (2005). Writing integrative literature reviews: Guidelines and examples. *Human Resource Development Review, 4*(3), 356–367. https://doi.org/10.1177/1534484305278283

Turns, S. R. (2012). *An introduction to combustion: Concepts and applications* (3rd ed.). McGraw-Hill.

Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing, 52*(5), 546–553. https://doi.org/10.1111/j.1365-2648.2005.03621.x