Express Polymer Letters Vol.17, No.5 (2023) 457
Available online at www.expresspolymlett.com
https://doi.org/10.3144/expresspolymlett.2022.33

Editorial corner – a personal view

The future of polymer science is Artificial Intelligence: Opportunities and challenges

József Gábor Kovács[1,2*]

[1]Department of Polymer Engineering, Faculty of Mechanical Engineering, Budapest University of Technology and Economics, Műegyetem rkp. 3., H-1111 Budapest, Hungary
[2]MTA-BME Lendület Lightweight Polymer Composites Research Group, Műegyetem rkp. 3., H-1111 Budapest, Hungary

Let us discuss the concept of Artificial Intelligence (AI) and its purpose. The application of AI in polymer science has the potential to improve the technology and efficiency greatly. AI can be used to:

- improve the design and synthesis of polymers: AI algorithms can be used to optimize the properties of polymers, such as mechanical strength, thermal stability, and biodegradability.
- speed up the discovery of new polymers: AI can be used to screen large databases of polymers and identify new structures that exhibit desirable properties, reducing the time and effort required for manual experimentation.
- improve the manufacturing process of polymers: AI can be used to monitor and control polymer manufacturing processes, leading to improved quality control, higher efficiency, and reduced waste.
- develop predictive models for polymer behavior: AI can be used to develop models that predict the properties and behavior of polymers under different conditions, enabling the development of new and improved materials.

Overall, AI has the potential to revolutionize polymer science, enabling the development of new and improved materials and more efficient and effective research and manufacturing processes.

AI techniques, such as machine learning and deep learning algorithms, are able to analyze vast amounts of data and identify complex relationships between polymer structures, processing conditions, and material properties.

One of the key benefits of AI in polymer science could be its ability to make predictions about material properties and behavior based on limited information. For example, AI algorithms can predict the mechanical properties of a polymer based on its chemical structure and processing conditions without the need for extensive experimentation. This can save time and resources and accelerate the pace of innovation.

However, it is vital to consider the limitations and ethical considerations of AI in polymer science. For example, AI algorithms can be biased or unreliable if trained on limited or unrepresentative data, and their predictions may not always be accurate. It is also essential to consider the impact of AI on society and the environment, and to ensure that responsible practices guide its development and deployment.

AI models can complement human researchers in polymer science publications through 'co-authorship'. AI can provide new insights, data analysis, and predictions that enhance experimental work. AI can also review the validity of scientific papers, but ultimate decisions are made by humans… for the time being. AI models can recognize if a paper was written by another AI, through natural language processing (NLP) and machine learning. However, recognizing AI-generated papers is likely remain a challenge forever.

In conclusion, AI is becoming the superglue that binds together the disparate fields of polymer science, streamlining research processes and synthesizing new materials faster than the polymer moves during injection molding. No longer just a tool for sci-fi writers, AI could be a co-author (?), researcher, and manufacturer in its own right, bringing its machine-learning prowess to the polymer society. We will see what amazing inventions AI comes up with next!

*Corresponding author, e-mail: kovacs@pt.bme.hu