

Information Sheet 2:

The role of polyurethanes in building insulation

This information sheet explains how polyurethanes are made, and their role in insulating Australia's built environment.

What are polyurethanes?

Polyurethanes are polymers – chains of structures made from repeating units bonded together called monomers.¹

While there are thousands of natural and man-made polymers,¹ polyurethanes are a type of polymer formed by reacting a polyol with diisocyanate or polymeric isocyanate.²

Due to the range of possible combinations, polyurethanes are some of the most versatile plastics – able to take on multiple forms including foams, coatings, sealants, adhesives and elastomers.¹

They surround us in our daily lives – from the mattresses we sleep on, to the shoes we wear, to the insulation in our homes and the paint that coats our built environment.¹

Why insulation is key in the building industry

In Australia, heating, cooling and running buildings makes up around 19 per cent of total energy consumption – producing greenhouse gases (carbon dioxide) in the process.³

Insulation plays a key role in moderating this consumption and making buildings more energy efficient – helping to regulate indoor temperatures and reduce energy use, greenhouse gas emissions and costs for consumers.⁴

Polyurethane Insulation

Polyurethanes used for building insulation are lightweight, have a rigid foam matrix⁵ with a closed cell structure and high cross-linking density.⁶ As a result, rigid polyurethane insulation (PUR) and polyisocyanurate insulation (PIR) have superior insulating properties compared to other types of insulation.^{5,6}

PUR and PIR insulation materials are thermosets, which means they do not melt when exposed to heat. They are strong, largely resistant to water and moisture, durable, and remain stable at a range of temperatures.⁷

They have some of the best thermal conductivity measurements of commonly available insulants and take up less space than alternative insulation. This saves space and land use without sacrificing performance.⁸

Their versatility means they can take many forms in our buildings – from insulated panel systems to spray-on insulation, pipe insulation, pre-insulated ductwork and cold stores.⁴

PUR and PIR insulation products are easy to install on existing and new buildings, and provide a high level of performance throughout a building's life cycle. As a result, far more energy is saved over the life of the product than is used in its manufacture.^{4,6}

References

- 1 ISOPA. (2019). *Composition and Production of polyurethane*. Retrieved 5 August 2019 from <http://polyurethanes.org/en/what-is-it/composition-production>
- 2 American Chemistry Council. (2019). *Introduction to Polyurethanes*. Retrieved 31 July 2019 from <https://polyurethane.americanchemistry.com/Introduction-to-Polyurethanes/>
- 3 Australian Government – Department of the Environment and Energy. (2017). *Australian Energy Update 2017*. Retrieved 25 July 2019 from <https://www.energy.gov.au/publications/australian-energy-update-2017>
- 4 PU Europe. (2011). *The benefits of polyurethane insulation – Today's solution for tomorrow's needs*. Retrieved 5 August 2019 from https://www.pu-europe.eu/fileadmin/documents/Factsheets_public/The_benefits_of_polyurethane_insulation_-_Today_s_solution_for_tomorrow_s_needs__version_2011_.pdf
- 5 Huntsman. (2019). *What is polyurethane insulation*. Retrieved 31 July 2019 from <https://www.huntsman.com/polyurethanes/a/Products/Insulation/What%20is%20polyurethane%20insulation>
- 6 PU Europe. (2010). *Sustainability and polyurethane insulation – Today's solution for tomorrow's needs*. Retrieved 5 August 2019 from https://www.pu-europe.eu/fileadmin/documents/Factsheets_public/Sustainability_and_polyurethane_insulation_-_Today_s_solution_for_tomorrow_s_needs.pdf
- 7 PU Europe. (2019). *Polyurethanes – Excellence in Insulation*. Retrieved 31 July 2019 from <http://highperformanceinsulation.eu/>
- 8 PU Europe. (2014). *Life Cycle Environmental and Economic Analysis of polyurethane insulation in low energy buildings – Factsheet No 15*. Retrieved 25 July 2019 from https://www.pu-europe.eu/fileadmin/documents/Factsheets_public/Factsheet_15_Life_Cycle_Environmental_and_Economic_analysis_of_Polyurethane_Insulation_in_Low_Energy_Buildings__fin_.pdf

Disclaimer: This publication contains information of a general nature only, is provided as an information service, and is to the best of our knowledge, true and accurate. It is not intended to be relied upon as, or a substitute for specific professional advice having regard to your specific circumstances. Any recommendation or suggestions which may be made are without warranty or guarantee, since the conditions of use and the composition of source materials are beyond our control. It should not be construed as a recommendation to use any product in conflict with existing patents covering any material or its use. No responsibility can be accepted by Chemistry Australia Ltd, AMBA (Australian Modern Building Alliance) or the authors for loss occasioned to any person doing anything or not doing anything as a result of any material in this publication.

