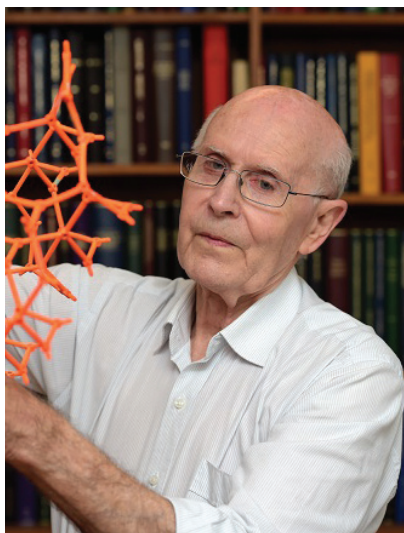


## THE NOBEL PRIZE IN CHEMISTRY 2025



**Susumu Kitagawa**

*Born: 4 July 1951, Kyoto, Japan  
Affiliation at the time of the award: Kyoto University, Kyoto, Japan*



**Richard Robson**

*Born: 4 June 1937, Glusburn, United Kingdom  
Affiliation at the time of the award: University of Melbourne, Melbourne, Australia*



**Omar M. Yaghi**

*Born: 9 February 1965, Amman, Jordan  
Affiliation at the time of the award: University of California, Berkeley, CA, USA*

The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry 2025 to **Susumu Kitagawa**, **Richard Robson** and **Omar M. Yaghi** “for the development of metal–organic frameworks”.

Their molecular architecture contains rooms for chemistry.

The Nobel Prize laureates in chemistry 2025 have created molecular constructions with large spaces through which gases and other chemicals can flow. These constructions, metal–organic frameworks, can be used to harvest water from desert air, capture carbon dioxide, store toxic gases or catalyse chemical reactions.

**Susumu Kitagawa**, **Richard Robson** and **Omar Yaghi** are awarded the Nobel Prize in Chemistry 2025. They have developed a new form of molecular architecture. In their constructions, metal ions function as cornerstones that are linked by long organic (carbon-based) molecules. Together, the metal ions and molecules are organised to form crystals that contain large cavities. These porous materials are called metal–organic frameworks (MOF). By varying the building blocks used in the MOFs, chemists can design them to capture and store spe-

cific substances. MOFs can also drive chemical reactions or conduct electricity.

“Metal–organic frameworks have enormous potential, bringing previously unforeseen opportunities for custom-made materials with new functions,” says Heiner Linke, Chair of the Nobel Committee for Chemistry.

It all started in 1989, when Richard Robson tested utilising the inherent properties of atoms in a new way. He combined positively charged copper ions with a four-armed molecule; this had a chemical group that was attracted to copper ions at the end of each arm.

When they were combined, they bonded to form a well-ordered, spacious crystal. It was like a diamond filled with innumerable cavities.

Robson immediately recognised the potential of his molecular construction, but it was unstable and collapsed easily. However, Susumu Kitagawa and Omar Yaghi provided this building method with a firm foundation; between 1992 and 2003 they made, separately, a series of revolutionary discoveries. Kitagawa showed that gases can flow in and out of the constructions and predicted that MOFs could be made flexible. Yaghi created a very stable MOF and

showed that it can be modified using rational design, giving it new and desirable properties.

Following the laureates' groundbreaking discoveries, chemists have built tens of thousands of different MOFs. Some of these may contribute to

solving some of humankind's greatest challenges, with applications that include separating PFAS from water, breaking down traces of pharmaceuticals in the environment, capturing carbon dioxide or harvesting water from desert air.

<https://www.nobelprize.org/prizes/chemistry/2025/press-release/>