

The Nobel Prize in Chemistry 2025

The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry 2025 to

Susumu Kitagawa

Kyoto University, Japan

Richard Robson

University of Melbourne, Australia

Omar M. Yaghi

University of California, Berkeley, USA

“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 corner-stones 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 specific 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.

Susumu Kitagawa, born 1951 in Kyoto, Japan. PhD 1979 from Kyoto University, Japan. Professor at Kyoto University, Japan.

Richard Robson, born 1937 in Glusburn, UK. PhD 1962 from University of Oxford, UK. Professor at University of Melbourne, Australia.

Omar M. Yaghi, born 1965 in Amman, Jordan. PhD 1990 from University of Illinois Urbana-Champaign, USA. Professor at University of California, Berkeley, USA.

Prize amount: 11 million Swedish kronor to be shared equally between the laureates

Further information: www.kva.se and www.nobelprize.org

Press contact: Eva Nevelius, Press Secretary, +46 70 878 67 63, eva.nevelius@kva.se

Expert: Olof Ramström, +46 70 433 42 60, ramstrom@protonmail.com, member of the Nobel Committee for Chemistry

The Royal Swedish Academy of Sciences, founded in 1739, is an independent organisation whose overall objective is to promote the sciences and strengthen their influence in society. The Academy takes special responsibility for the natural sciences and mathematics, but endeavours to promote the exchange of ideas between various disciplines.

BOX 50005, SE-104 05 STOCKHOLM, SWEDEN

TEL +46 8 673 95 00 • WWW.KVA.SE

BESÖK/VISIT: LILLA FRESCATIVÄGEN 4A, SE-114 18 STOCKHOLM, SWEDEN



KUNGL.
VETENSKAPS-
AKADEMIEN

THE ROYAL SWEDISH ACADEMY OF SCIENCES