AI-powered research and development for the energy sector

Project DREAM is developing magnetic materials that reduce the UK's clean energy sector's reliance on rare-earth elements.

In brief

Materials Nexus and the University of Sheffield are collaborating to re-shape the magnet supply chain by producing magnets with a reduced rare-earth content. Currently, electric vehicle, wind-turbine and robotics manufacturers depend entirely on foreign magnet imports to power their electric machines.

The project partners are using leading scientific, machine-learning and experimental techniques to identify an alternative material to rare-earth magnets. Project DREAM aims to strengthen the UK's supply chain, while bringing down the cost of electric-vehicle motors, wind turbine generators and robotic actuators, and reducing the environmental footprint of technologies underpinning the energy transition.

A robust, sustainable future

The Innovate UK vision for materials and manufacturing is a future in which the UK is a leader in the development of sustainable materials. Through this vision, the country will act as a global innovation hub while securing a robust supply chain capable of meeting renewable energy targets.

Magnetic materials will play an important part in realising this vision. The motors inside electric vehicles and wind turbines, for example, rely on magnets to operate. However, mining minerals for rare earth elements harms the environment and their processing is resource intensive. Meanwhile, acquiring them depends on uncertain global supply chains.

Fast solutions to urgent problems

Project DREAM, a collaboration between Materials Nexus and University of Sheffield, is developing rare-earth free magnetic materials to replace existing rare earth magnets. Its aim is to provide a secure supply of a clean, cost-stable alternative to electric vehicle, wind turbine and robotics manufacturers.

Materials Nexus is using artificial intelligence to rapidly scan the periodic table of elements for replacements of existing materials that face supply, cost, performance or environmental challenges. Meanwhile, University of Sheffield is providing the infrastructure to synthesise and characterise Materials Nexus' outputs.

The collaboration represents a radical approach to R&D that eliminates the need for slow and costly trial-and-error. The result is a rapid innovation cycle capable of solving technological challenges in months instead of years.

Aligning with a long-term vision

The development of sustainable, next-generation magnets is urgent and complex. The project has shown that by bringing together talented people the UK can solve such technological challenges.

Project DREAM will help to make UK materials and manufacturing more resource efficient, more resilient and more technologically advanced. The project will undoubtedly inspire many to work in these exciting sectors.

Chaco van der Sijp, Innovate UK's Innovation Lead Manufacturing, said: "This is a ground-breaking project using innovative machine learning software, and its development has been enabled by Innovate UK funding. This could have a significant future impact on our net zero ambitions, through renewable energy and low-carbon transport, by removing the need for rare earth elements in high-performance permanent magnets."

Funding information

Materials Nexus is a materials discovery and development company that aims to reduce the environmental impact of materials in technology, from high-tech to everyday products. The company has received three grants from Innovate UK to support its efforts in magnets.

Materials Nexus's CEO Jonathan Bean said: "Innovate UK's support has allowed us to scale our team, attract international talent and continue to develop new materials. It has also enabled us to make significant progress in our projects, attract new investment and generate excitement around our work."

"This ground-breaking project could have a significant future impact on our net zero ambitions, through renewable energy and low-carbon transport, by removing the need for rare earth elements in high-performance permanent magnets."

Chaco van der Sijp,
Innovate UK's Innovation Lead Manufacturing