

MATERIALS FOR BIOELECTRONICS IN HEALTHCARE STRATEGY AND ACTION PLAN

Headline findings to date
April 2024

Prepared by Urban Foresight

ROYCE

ABOUT THIS DOCUMENT

The Henry Royce Institute for advanced materials (Royce) is undertaking an ambitious strategy development activity relating to materials for bioelectronics in healthcare.

The institute has appointed a partnership between Urban Foresight, ScotChem, and CPI to define and explore actions that will meet the growing demand for advanced materials for bioelectronics.

This document presents our findings to date having completed:

1. Scope definition
2. Initial landscape mapping, including a literature review, patent search, company search, and funding analysis.
3. Stakeholder mapping
4. A high-level economic model

The next stage of this process, stakeholder engagement, will inform the creation of a strategy and action plan for the materials innovation in the UK for bioelectronics.

These headline findings and accompanying graphics are available to use to promote the survey's development and to encourage interested stakeholders to complete the survey.

SCOPE STATEMENT

Bioelectronics is the electronic monitoring and control of biological systems for applications in medicine, agriculture, industry, and the environment. It brings together biology, engineering, and materials science.

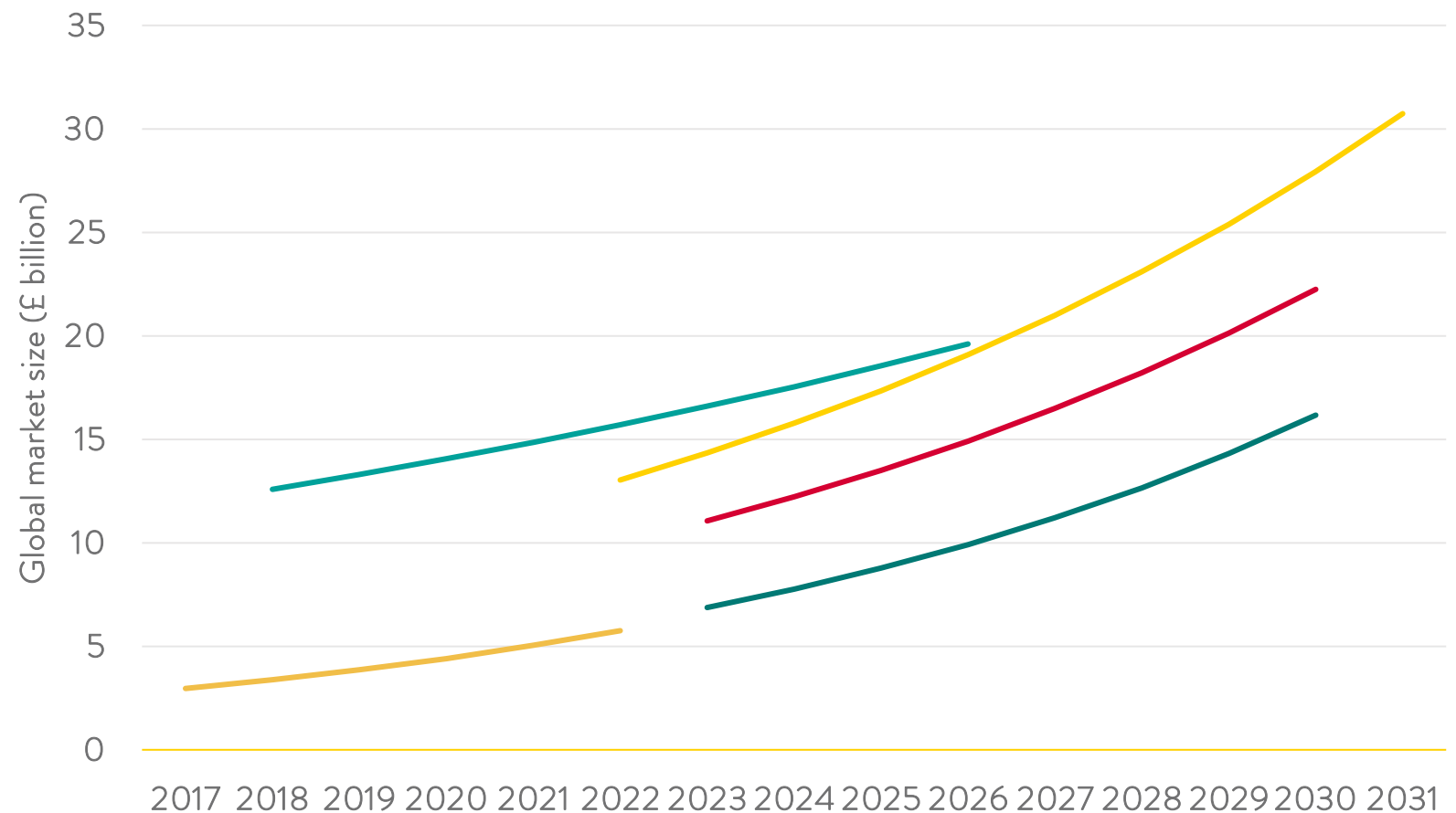
- This project will focus on materials for bioelectronics in healthcare.
- These are materials which are important to the function of electronic systems that directly interface with biological systems (in vivo or in vitro) for the purposes of prevention, monitoring, diagnosis, and treatment of disease, for patient rehabilitation, and for improving health in general.

GLOBAL BIOELECTRONICS MARKET SIZE

The estimated global market size for bioelectronics was between £6.0 billion and £15.7 billion in 2022.

The global market size for bioelectronics could reach between £16.2 billion and £28.0 billion by 2030.

Estimated global market sizes and growth 2017 – 2031 from different sources



PROBLEM STATEMENT

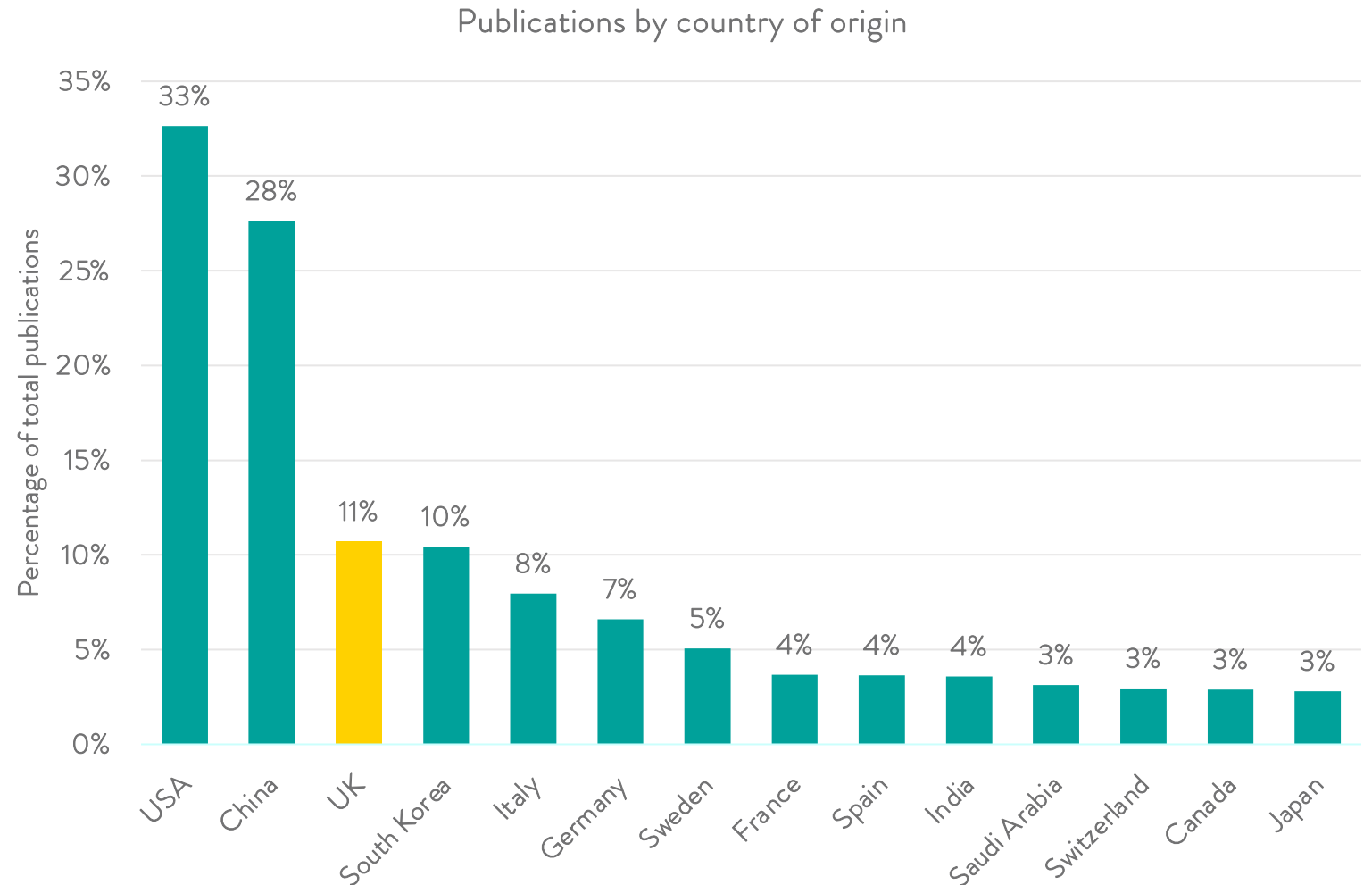
Materials will play a key role in supplying safe and responsible bioelectronic healthcare solutions in the future.

The research into materials developed for bioelectronic healthcare solutions must be translated effectively to ensure a safe and consistent supply.

- Royce wants to support materials translation to provide these materials and ensure that the UK can capture a share of this emerging global market.
- Royce is developing a strategy to identify the strengths and opportunities in the UK and promote action plans for growing the sector.

UK PROMINENCE IN BIOELECTRONICS RESEARCH

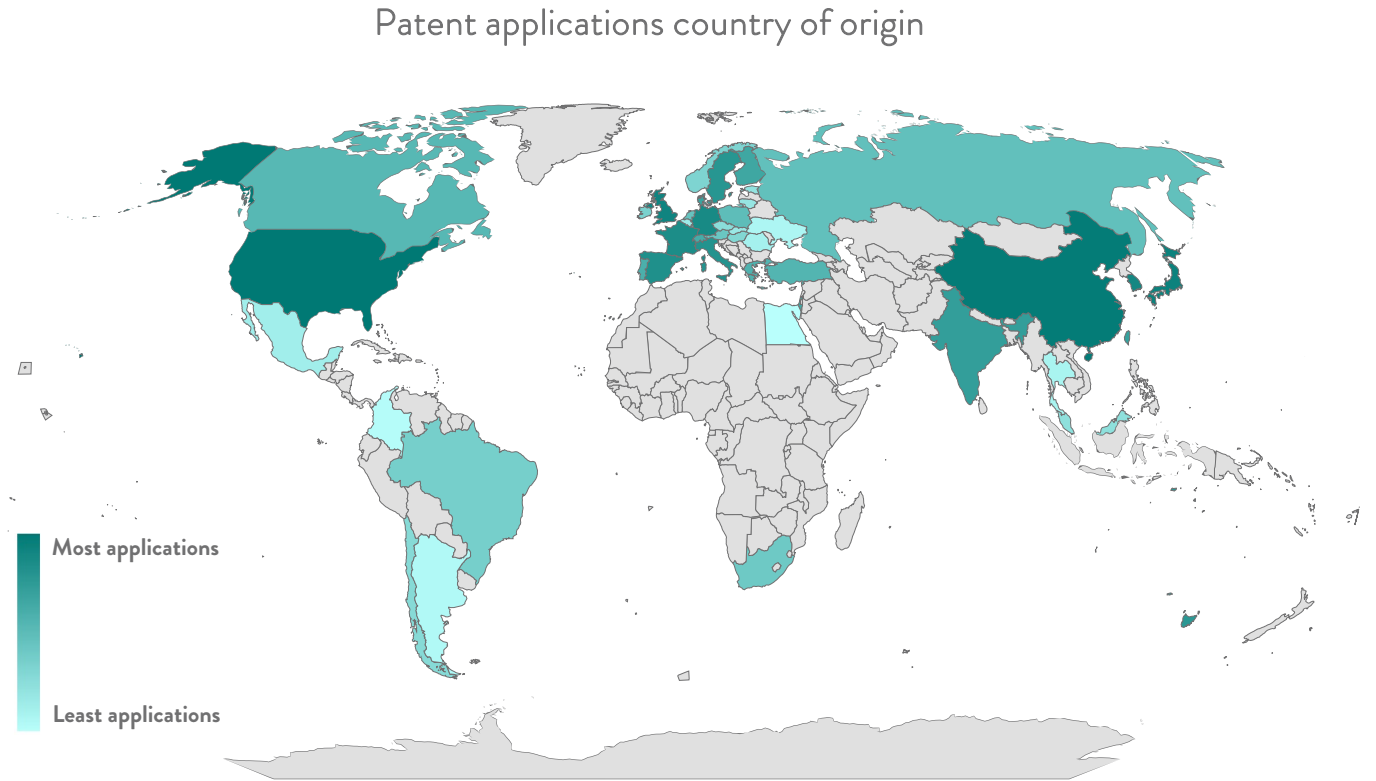
The UK has an active research sector in bioelectronics, producing around 11% of scientific papers published globally in the sector.



INNOVATION LOCATIONS

The US and China are responsible for applying for 65% and 11% respectively of the total bioelectronic patents in the world.

UK provides 2.64% of all bioelectronics patent applications – the highest of any European country.



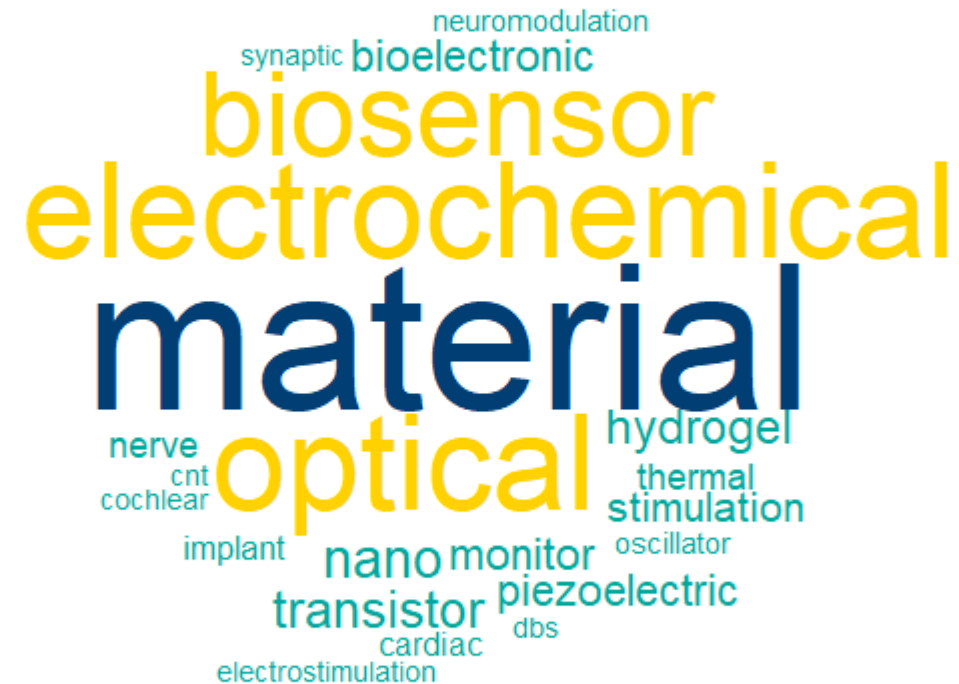
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PUBLICATIONS AND PATENTS ANALYSIS

“Materials” is a driver of innovation in the sector: 1 in 4 scientific papers on bioelectronics are related to materials science.

Materials is also the most frequently used word in bioelectronics patent abstracts

Most common terms in bioelectronic patent abstracts

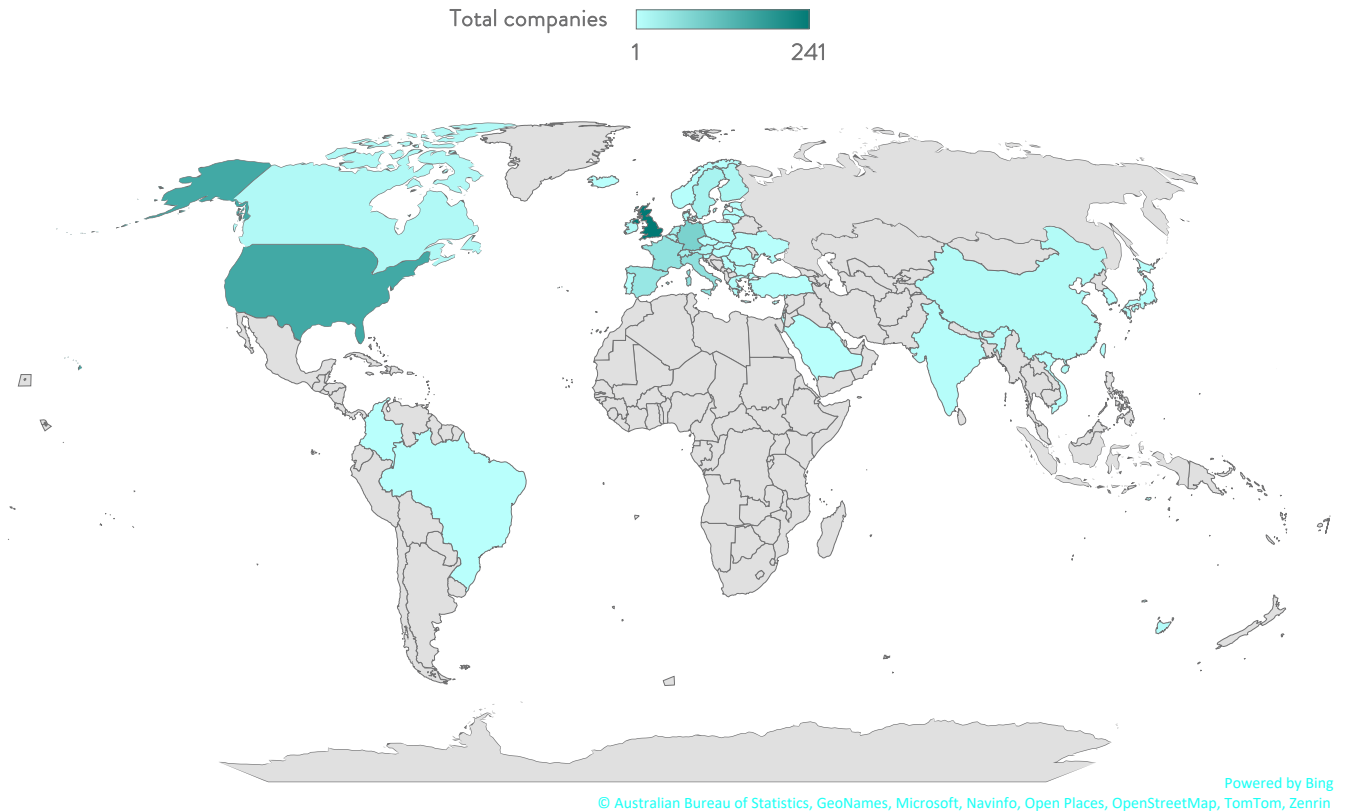


SECTOR ORGANISATIONS

This research has so far identified over 1,200 organisations worldwide with an interest in materials for bioelectronics in healthcare.

This includes 118 academic organisations, and 1,035 companies. 241 of these companies are based in the UK.

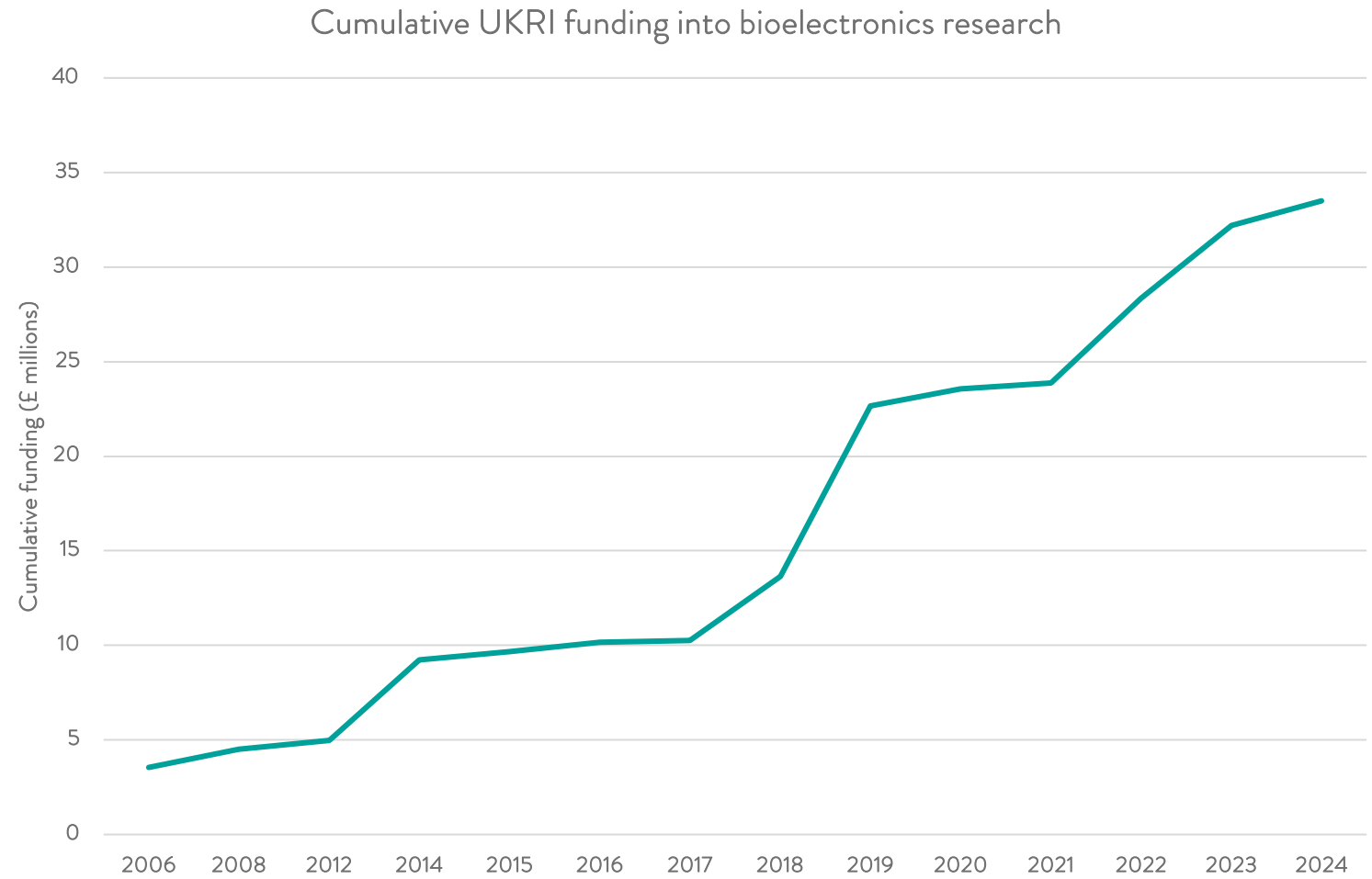
Number of bioelectronics companies identified



UK BIOELECTRONICS RESEARCH FUNDING

The UK has invested **£33.5 million** into bioelectronics research between 2006 and 2023.

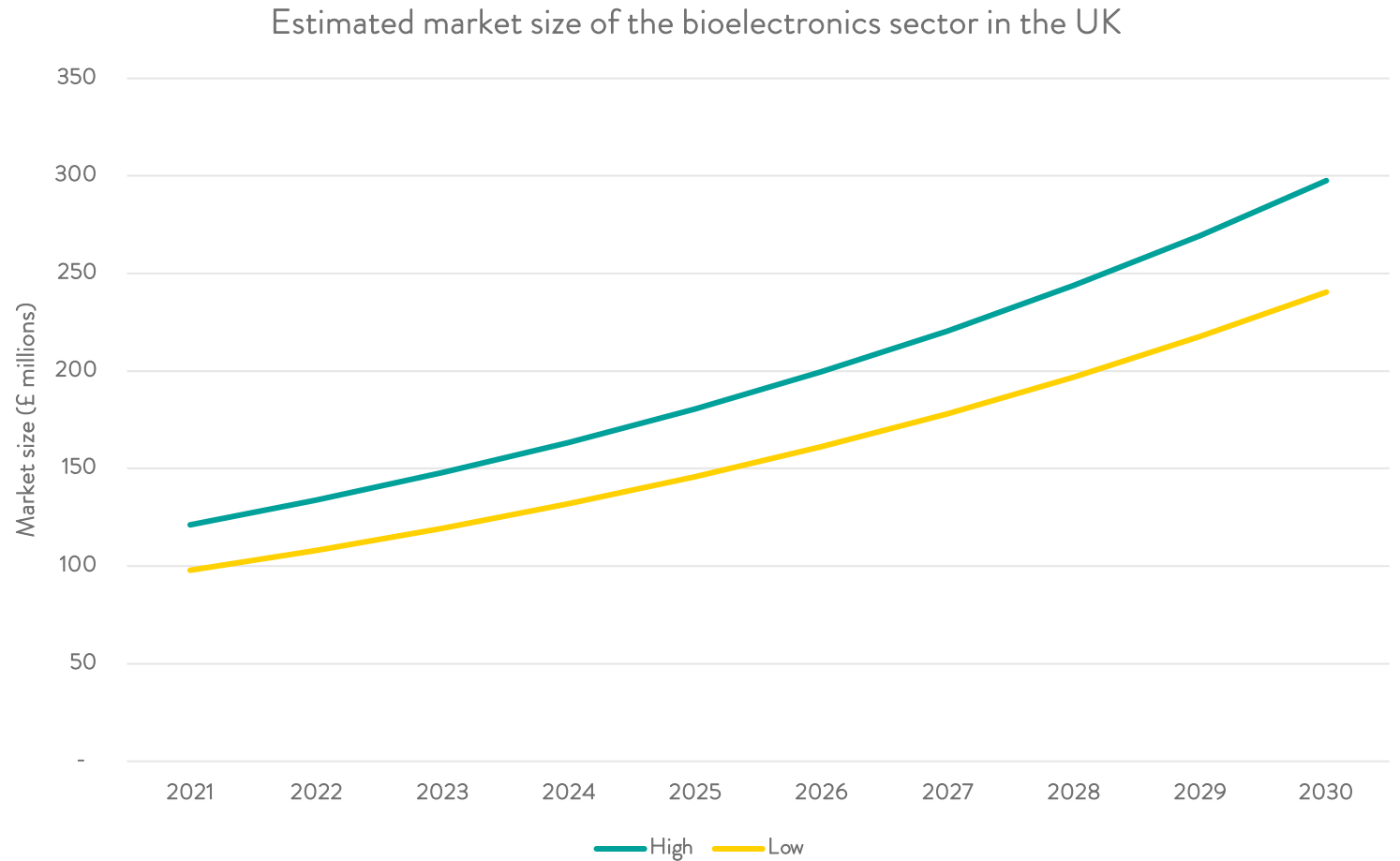
The largest rise in funding was in 2022 with over a **£5 million** increase in UK Research and Innovation (UKRI) funding into bioelectronics research.



THE UK'S BIOELECTRONICS MARKET SIZE

The estimated market size for the bioelectronics sector in the UK in 2024 is between £132 million and £163 million

The projected market size for the bioelectronics sector in the UK by 2030 could be between £240 million and £298 million



APPENDIX

NOTES, ASSUMPTIONS AND SOURCES

Notes 1 of 5

Scope statement

1. A proposed scope statement for the study has been produced. It is based on:
 - Initial research into how other groups have defined “Bioelectronics”
 - The descriptions used in relevant scientific conferences and meetings
 - Research interests of academic and industry stakeholders identified by Royce
 - The interests of UK companies developing products related to Bioelectronics
 - Advice from the Royce project steering group

Global bioelectronics market size

1. The global market size for bioelectronics is estimated by plotting the projections from various market reports:
 - Health Research International (2018) “Emerging Bioelectronic Medicine & Neurostimulation technologies: Growing & Disrupting Global Medical Device Markets”
 - Industry Research. (2023). “Bioelectronics Market: Analysis of Present and Future Growth | 2031”
 - Global Information. (2023). “Bioelectronics Market Forecasts to 2030 - Global Analysis By Type, Product Type, Application, End User and By Geography”
 - Grand Research Store. (2024). “Bioelectronics and Biosensors Market, Global Outlook and Forecast 2024-2030”
2. These reports have slight variations in their definitions of bioelectronics, so the reports that are included fit within the scope defined for this project.
3. The units have been converted from US Dollars to GB Pounds using the exchange rate of \$1 = £0.79 (correct as of 04/04/2024)

Notes 2 of 5

Problem statement

1. This problem statement has been developed to frame the potential for materials innovation in enabling the UK bioelectronics sector to grow. It motivates the need for a strategy and action plan.

UK prominence in bioelectronics research

1. The publication data was drawn from three sources: Scopus, Web of Science, and SciFinder.
2. These were then compiled, organised into country of origin, and cleaned for duplicates.
3. The search terms used were “bioelectronic” and “bioelectronics”.

Notes 3 of 5

Innovation locations

1. The patent data analysed was drawn from Lens.org using “bioelectronic” and “bioelectronics” as search terms.
2. Country names are matched according to ISO codes from the priority numbers to find the locations where the patents are likely being developed.

Publications and patents analysis

1. This analysis compiled the patents and publications from the sources referenced before, and used textual analysis to evaluate the frequency of a selection of terms in their abstracts.

Notes 4 of 5

Sector organisations

1. To define the bioelectronics sector, a range of existing definitions produced by academic groups, conferences, journals, and companies working in the sector were collated. These were used to create a single definition and list of activities considered in and out of scope, which was then refined by consulting key stakeholders.
2. The organisations considered in sector were identified from a number of sources, including the EU Horizon funding database, UK Government bioscience and health technology sector statistics, US National Science Foundation grants, bioelectronic patent searches, and proprietary commercial sources.

UK bioelectronics research funding

1. UKRI funding of research projects and PhD studentships was filtered for descriptions that included the terms “bioelectronic” and “bioelectronics”.
2. The total funding per year was calculated and a graph was created for cumulative funding for each year.

Notes 5 of 5

UK bioelectronics market size

1. The estimated UK bioelectronics market size is found by using the total turnover of the defined sector as a proxy.
2. It is assumed that large companies do not focus completely on bioelectronics. The percentage of turnover attributed to bioelectronics is therefore limited to 10%, which is the average percentage of patent activity that large companies focus on bioelectronics out of their total patent activity.
 - This percentage was calculated by creating a dataset with a selection of large companies from Lens.org
 - The ratio of bioelectronics patents filed (using the search filter mentioned before) versus total patents filed was calculated for each company. The average of these ratios was then taken to give a result of 10%.
3. To estimate future growth, it is assumed that the UK market will grow at the average compounded annual growth rate (CAGR) estimated across the global market reports = 10.5%

This report was commissioned by Royce as part of its role around convening and supporting the UK advanced materials community to help promote and develop new research activity. The overriding objective is to bring together the advanced materials community to discuss, analyse and assimilate opportunities for emerging materials research for economic and societal benefit.

The Henry Royce Institute was established to ensure the UK can exploit its world-leading expertise in advanced materials and accelerate innovation from discovery to application. With over £200 million of facilities in dedicated state-of-the-art laboratories, Royce is ensuring that academics and industry in the UK's materials community have access to world-class research capabilities, infrastructure, expertise, and skills development.

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