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In the Lab

A Biotechnology and Biological Sciences Research Council Network in Industrial Biotechnology and Bioenergy

***Johnson Matthey Technology Review* features laboratory research**

NON-PEER REVIEWED FEATURE

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The Biotechnology and Biological Sciences Research Council (BBSRC) funded six Networks in Industrial Biotechnology and Bioenergy (NIBB) for a second phase in 2019 and previously 13 BBSRC NIBB for a first phase in 2014. These networks promote interactions between academia and industry to advance research along the technology readiness levels (TRLs). The networks fund collaborations that start in the region of TRL2 and Johnson Matthey contributes to the management of one of these BBSRC NIBB entitled 'The Elements of Bioremediation, Bio-Manufacturing and Bioenergy (E3B)'. This network brings together communities working on metals in biology.

About the Research

Almost a half of the reactions of life are catalysed by metals. This means that a large proportion of bioindustries depend directly or indirectly on the catalytic activities of metals in proteins. Academic members work with biomanufacturing and bioenergy sectors to enhance metalloenzyme activities to generate new products and to increase the profitability and sustainability of existing products. Members also work to valorise metal-contaminated wastes and especially to develop ways to biorecover at-risk metals in valuable forms to progress towards a more sustainable circular economy.

Johnson Matthey has also partnered on the following five funded projects, four of which have reached completion:

- BIVMiB037 with The University of Manchester, UK: 'Exploiting the Commercial Potential of Novel Biometallic Catalysts'

The Researcher

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- ISCFPOCMiB041 with The University of Manchester: 'Biosynthesis of Bimetallic Nanoparticles for Fine and Specialty Chemical Production'
- POCE3B002 with The University of York, UK: 'Enhancing Metal Uptake and Nanoparticle Deposition in Plants to Recover Platinum Group Metals and Gold'
- POCE3B020 with The University of Oxford, UK: 'FLAVH2: Establishing Feasibility for a Metalloenzyme System for Dihydrogen-Driven Flavin Recycling for Chemical Synthesis in Industrial Biotechnology'
- BIVE3B001 with The University of Manchester: 'Developing a Novel Chemo-Enzymatic Catalytic Cascade for the Production of Stereoselective High-Value Chemicals'. Research in progress at the time of writing.

The E3B BBSRC NIBB website hosts a 'metalation calculator' which allows users to simulate what metals will bind to a protein inside a living cell (**Figure 1**). This is of use for industrial biotechnological fermentations driven by metalloenzymes especially in engineered organisms. The metals that bind to proteins in cells depend on relative metal availabilities in combination with the binding properties of the enzyme (1–3). In engineered organisms these properties can become mismatched leading to mis-metalation or under-metalation. The calculator allows metalation to be simulated and then optimised either by targeted metal supplementation of the growth medium or by further engineering the organism or metalloenzyme. New versions of the calculator are being developed for strains that are commonly used in industrial biotechnology under defined culture conditions.

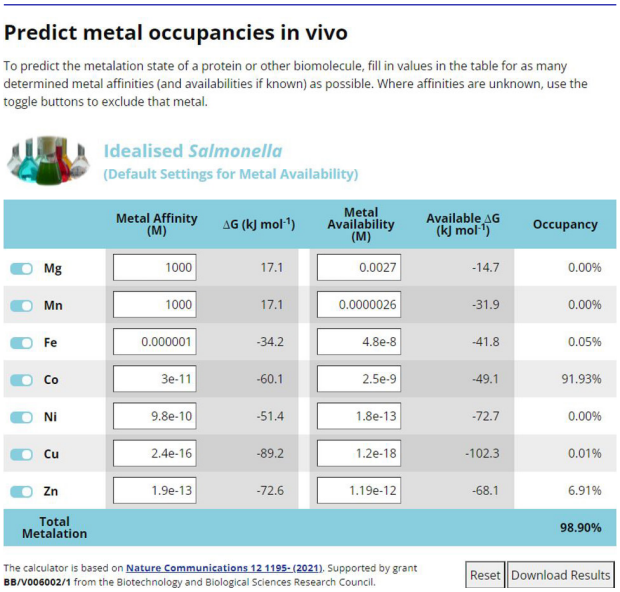

Fig. 1. First version of a biological enzyme metalation calculator available on the E3B BBSRC NIBB website. New versions are being released for strains used in industrial biotechnology under standard culture conditions

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References

1. T. R. Young, M. A. Martini, A. W. Foster, A. Glasfeld, D. Osman, R. J. Morton, E. Deery, M. J. Warren, N. J. Robinson, *Nat. Commun.*, 2021, **12**, 1195
2. D. Osman, M. A. Martini, A. W. Foster, J. Chen, A. J. P. Scott, R. J. Morton, J. W. Steed, E. Lurie-Luke, T. G. Huggins, A. D. Lawrence, E. Deery, M. J. Warren, P. T. Chivers, N. J. Robinson, *Nat. Chem. Biol.*, 2019, **15**, (3), 241
3. A. W. Foster, T. R. Young, P. T. Chivers, N. J. Robinson, *Curr. Opin. Chem. Biol.*, 2022, **66**, 102095

