Contribution ID : **135** Type : **Oral Presentation**

Quantum Computing for Industrial Materials: A Johnson Matthey Perspective

Johnson Matthey (JM) envisions a cleaner, healthier world for present and future generations. As global leader in sustainable technologies, the company leverages science to accelerate the net-zero transition for its clients. Through scientific innovation, the company improves the lives of millions worldwide. JM is focused on facilitating four critical transitions: reducing transport emissions, transforming energy emissions, decarbonizing chemical production, and establishing a circular economy.

Quantum computing, while still in its early stages, holds immense potential to revolutionize various industries by tackling problems currently intractable for even the most powerful supercomputers. Some potential roles of quantum computing include simulation (Scientific Research and Engineering) and machine learning.

As a company, we are strategically harnessing the power of quantum computing to address real-world industrial challenges in materials science and beyond. Seeing the transformative possibilities of this emerging technology, JM is actively pushing for its industrial use. This is complemented by active collaboration within the quantum computing community through initiatives like feasibility studies (e.g., Innovate UK), participation in quantum computing events, and our consistent involvement in the National Quantum Computing Centre (NQCC) Quantum Hackathon.

JM's exploration focuses on high-impact industrial applications, including catalyst simulation for designing more efficient materials, quantum resource estimation for future planning, quantum machine learning for enhanced data analysis, and advanced Density Functional Theory for more accurate materials modelling. Our commitment to the field is further evidenced by participating in scientific publications.[1],[2]

JM is proactively shaping quantum algorithm development[3] to directly benefit our industrial future. As part of that, we've explored different real-world challenges with quantum computing using feasibility studies in collaboration with partners from Academia and Quantum Industry. A selection of materials will be presented and discussed emphasising on what was the value from JM's industrial perspective. With a keen eye on near-term applications in quantum chemistry and materials science, JM is leveraging our deep expertise to effectively utilise quantum computing for tangible business value.

[1] J. Tilly, G. Jones, et al., Phys. Rev. A, 2020, 102, 062425.

[2] A. V. Ivanov, C. Sünderhauf, N. Holzmann, T. Ellaby, R. N. Kerber, et al., Phys. Rev. Research, 2023, 5, 013200.

[3] A. Montanaro, npj Quantum Inf, 2016, 2, 15023.

Primary author(s) : Dr. KERBER, Rachel (Johnson Matthey)

Co-author(s) : Dr. JOHNSON, Timothy (Johnson Matthey); Dr. SARWAR, Misbah (Johnson Matthey)

Presenter(s) : Dr. KERBER, Rachel (Johnson Matthey)