

For immediate release

Three-year Quantum Computing Project MATQu Concludes Successfully

Saint Denis, France - After three years, the pan-European MATQu (Materials for Quantum Computing) project has concluded. At the end of May, local partners Orange Quantum Systems and Delft Circuits hosted a final review meeting in Delft, Netherlands.

The goal of MATQu was to establish a complete European value chain for building superconducting qubit chips, including critical elements like Josephson junctions and resonators. Key research technology organizations (RTOs) and leading European companies participated in the project.

Technic's Contributions:

- **3D Packaging Architectures:** Technic played a significant role in fabricating new 3D packaging architectures, working closely with RTOs such as Imec and CEA-Leti, and BESI, a leading supplier of semiconductor assembly equipment.
- **Indium Plating Solution:** Technic contributed to the development of a new indium plating solution (Elevate In 4900) for the growth of indium microbumps.
- **Selective Wet Etchants:** These solutions were designed to remove superconducting materials, like ruthenium and niobium, while being compatible with indium. These materials are ideal for assembly due to their superconducting properties at very low temperatures, essential for the computing operations of Josephson junctions in cryogenic conditions (< 1 K).
- **Qubit Densification:** Researchers devised a 3D design enabling a dense integration of superconducting qubits, replacing traditional bonding wires with vertical interconnects, known as Through Silicon Vias (TSVs). This innovation minimizes internal signal connection lengths in silicon, providing faster operation, reduced heat production, and lower power consumption.
- **TSV Cleaning Solution:** TechniClean BOS 390 was developed to remove the fluoropolymer deposited during TSV fabrication (Bosch process). This cleaning formulation was assessed and validated along with MATQu partners.

Contributors:

- **Research Technology Organizations (RTOs):** imec, CEA-Leti
- **Local Partners:** Orange Quantum Systems, Delft Circuits
- **Leading European Companies:** BESI
- **Technic Team:** Researchers and experts in chemical processes development, including metal plating, selective wet etching, 3D structures cleaning, and photoresist stripping.

Dissemination and Impact:

These collaborative works were shared during the SPCC 2022 and ECTC 2024 conferences and in scientific journals (MicroElectronic Engineering and IEEE). Over its three-year duration, the MATQu project demonstrated the capabilities of the European ecosystem to innovate in the fields of quantum elements, assemblies, connectors, and software development, paving the way for the future of quantum computing.

About Technic: For over 75 years, Technic has been a global supplier of specialty chemicals, custom finishing equipment, engineered powders, and analytical control systems to the semiconductor, electronic component, printed circuit board, industrial finishing, and decorative industries. Technic is also a major supplier of engineered metal powders to the solar industry.

Press Contact: Bob Sheeran, Global Marketing Manager, bsheeran@technic.com

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