High-temperature superconducting wire joint technologies leading to innovative reduction of energy loss

Social implementation of super-high field NMRs and DC superconducting cables for railway systems, through advancement of joint-technology between high-temperature superconducting wires

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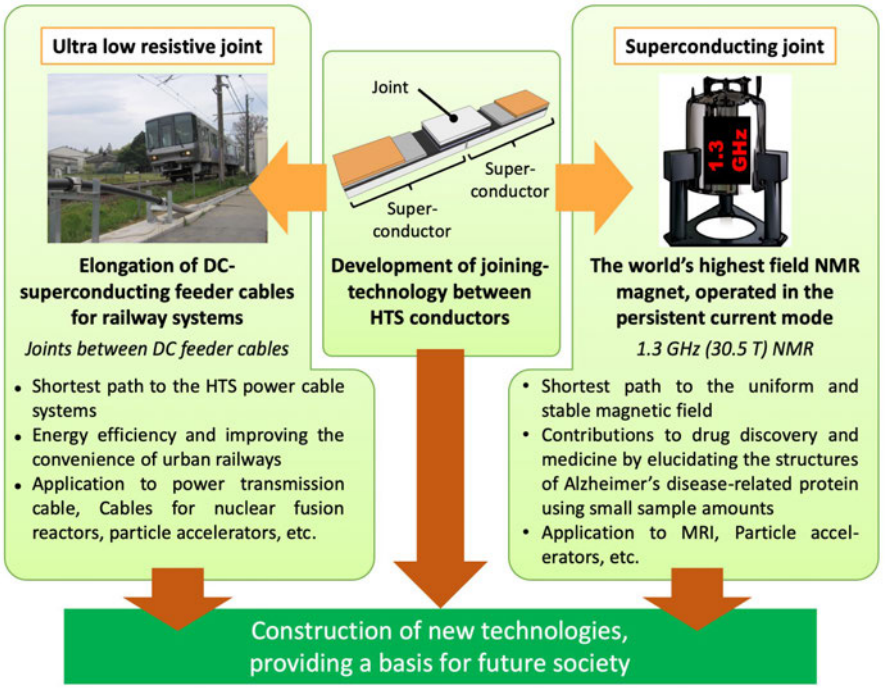
Summary : Low temperature superconductors require liquid helium, while only generating a magnetic field less than 24 T. For full-fledged commercialization, high temperature superconducting (HTS) conductors are preferred as they are cooled by liquid nitrogen, generating a much higher magnetic field. However, the drawback of the HTS conductor is its availability only in short lengths of a single conductor, such as 500 m. This necessitates many joints being installed in the superconducting apparatus, resulting in difficult manufacturing process and a complicated operatingprocedure. Hence, we have commenced a new project, comprising two R&D items: (a) development of superconducting-joints (10^{-13} Ω) between HTS conductors, which are installed in the world's highest field persistent current mode 1.3 GHz (30.5 T) NMR; the joining performance is evaluated based on NMR spectra: (b) development of ultra-low resistive joints(10^{-7}～10^{-8} Ω) between DC superconducting feeder cables, > 100 mm in diameter, for railway systems, which are evaluated by the operational test of a train in the Railway Technical Research Institute.



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