

## High Temperature Superconductors and Their Applications

Arno Godeke

Independent Consultant, Hengelo, Overijssel, Netherlands

Email: [agodeke@icloud.com](mailto:agodeke@icloud.com)

***Abstract***— The High Temperature Superconductors (HTS)  $\text{Bi}_{2-x}\text{Pb}_x\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y$  (Bi-2223),  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_x$  (Bi-2212), and [Rare-Earth]  $\text{B}_2\text{C}_3\text{O}_x$  (REBCO) have matured to a level where they are becoming attractive for commercial applications: They are available in kilometer lengths, can be cabled in various configurations, possess reproducible and predictable properties, and can be produced at cost-levels that are becoming commercially interesting. Their increased field-temperature phase boundaries further enable application beyond the limitations of Low Temperature Superconductors (LTS). Since their discovery in the 1980's, and their optimization into practical superconductors during the 1990's, many demonstration projects have been executed in attempts to trigger commercial use. It is, however, only recently that real applications of HTS are starting to emerge, indicating the dawn of commercial use of HTS, some 35 years after their discovery. It is to be expected that climate change, and the emphasis on more efficient energy generation, use, and transport, as well as reduced availability of liquid helium, will further amplify the incentives of HTS into commercial markets. In my presentation, I will discuss the current commercial HTS conductors, and objectively compare the key properties that are relevant for commercial implementation. I will further summarize the emerging commercial usage landscape, indicate where modelling will be critical, and conclude with an outlook for expected commercial use of HTS in the near future.

***Keywords (Index Terms)*** — High Temperature Superconductor, Bi2223, Bi2212, REBCO.

IEEE CSC & ESAS SUPERCONDUCTIVITY NEWS FORUM (global edition), July 2022

Plenary presentation PL2 was given at HTS 2022, 14-16 June 2022, Nancy, France (Hybrid).