High performance nanostructured coated conductors by chemical processing

Sprawozdania

Informacje na temat projektu

HIPERCHEM

Identyfikator umowy o grant: 516858

Projekt został zamknięty

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Ten projekt został przedstawiony w...

Final Report Summary - HIPERCHEM (High-performance nanostructured coated conductors by chemical processing)

The ultimate aim of the HIPERCHEM project was to develop radically innovative low-cost technologies for the mass production of nano-structured high temperature superconducting materials based on chemical solution processing. Within this envelope the development of novel nano-structuring methodologies for the growth of epitaxial nanocomposite films and coated conductors with excellent performance were targeted. The originality of the project lay in the fact that two rapid growth rate chemical processing techniques, namely Metal-organic decomposition (MOD) and Hybrid liquid phase epitaxy (HLPE), were combined to grow epitaxial REBa2Cu3O7 (YBCO) high-temperature superconductor films with bottom-up nano-structuring strategies. The purpose was to achieve an artificial network of nano-defects that would immobilise the superconducting vortices and, hence, allow the achievement of high critical currents and give weak magnetic field dependence in films and Coated conductors (CCs) with high thickness.

The first general strategy for nano-structuring the superconducting layers was based on the generation of coherent randomly distributed nano-structures, such as nano-dots. The second strategy was to engineer nanostructures originating at the substrate interface, either based on strain-induced self-assembling principles or on polymer track-etched cylindrical nanopores generated by ion bombardment. The final technological goal was to develop nanostructured coated conductors with a total critical current of 400 A in a 1 cm wide tape and to achieve a reduction in its thickness and magnetic field dependence by a factor of 3 compared to the state-of-the-art.

The specific scientific and technological objectives of the HIPERCHEM project were to:
- provide 'proof-of-concept' that nano-structuring epitaxial films would lead to conductors that carry a total current of 400 A in a 1 cm wide tape and display areduction in thickness and magnetic field dependence by a factor of 3 compared to the present state of the art;
- provide 'proof-of-concept' that the chemical processing approaches of MOD and HLPE could produce state-of-the-art CCs which would be compatible with bottom-up nano-structuring techniques, at growth rates 5 times larger (2 nm/s) than the state-of-the-art and at low cost;
- select the most promising nanostructuring approaches and demonstrate the feasibility of implementation

on a pilot scale by making at least 1 m of CC;
- protect the new inventions by patents and publish results in scientific journals

Powiązane dokumenty

Final Report - HIPERCHEM (High-performance nanostructured coated conductors by chemical processing)

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