

Properties of new superconductors which can make them useful.

Alex Gurevich

Department of Physics, Old Dominion University, Norfolk VA, US

Discoveries of new superconductors and advances in R&D of high- T_c cuprates and Fe-based pnictides have shown that such captivating characteristics as high critical temperature and upper critical magnetic field are the only ones which can assure applications at high magnetic fields and temperatures. Making superconductors useful involves complex and expensive technologies addressing many conflicting physics and materials requirements specific to particular applications and depending on the operating field and temperature. In this talk I discuss the materials properties which would be desirable in new practical superconductors, and the ways by which the performance of existing superconductors can be enhanced. It turns out that such properties as high carrier density and weak electronic anisotropy are characteristics on the normal state and may not be instrumental to microscopic mechanism of superconductivity. As an example, I consider the physics and materials science behind the optimization of superconductors operating at high magnetic fields and temperatures. Eventually, the most practical superconductors may not have the best superconducting properties but provide the best compromise between physics, materials science, technology, environmental impact, and cost.