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Superconductivity-Editorial Note

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Editorial

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EDITORIAL NOTE

Numerous of researching is to search room temperature superconductor whose finding make a revolution in energy demand, supply and conservation. Mainly the research is based on experimental, theoretical, and computational. Major elements involved to find superconducting materials are based on coppers, molybdenum, magnesium, hydrogen, iron, carbon, and so on. The different parameters to study the properties of supercenters are magnetic field, pressure, orbital interaction, temperature, phonon-electron coupling, energy band, Hamiltonian, energy gap, doping, superfluid velocity, and so on. A latest experiment on hydrogen rich compound with lanthanum was down at 267 Gpa pressure show superconductor exist at 287K on temperature. Therefore, superconductivity field is one of the most important research field in present and have future scopes. Super hydrides are hydrogen-rich materials that appear to become superconducting at high temperatures and pressures. The properties of such superconductor are different from both conventional and unconventional.

Present and Future of Superconductor Materials

In present superconductor are used in different field like Transforming the Electricity Grid, Improving Wide-Band Telecommunication, Aiding Medical Diagnosis, Superconductivity and Big Science (Colliders), Sustainable mobility: the dream of a superconducting airliner, Electronic applications of superconductivity, Superconducting magnets, Magnetic Resonance Imaging (MRI), Nuclear Magnetic Resonance (NMR), High-energy physics accelerators, Plasma fusion reactors, Industrial magnetic separation of kaolin clay and so on. The development on similar field going on. Example, Superconductors represent also the enabling factor for the International Thermonuclear Experimental Reactor (ITER). The first plasma of ITER is scheduled for December 2025 and this will represent an important milestone towards the next-stage device. DEMO will follow ITER around 2050 but a number of other initiatives are being launched by research institutions and private companies around the world.

Challenges in superconductor

Physicists have also been challenged to provide a theory for high-temperature superconductivity. The atomic structure of the new superconductors is quite different from that of the known materials to outstanding feature of the new high-temperature materials likes oxides based electrical insulators. Some example, copper and oxygen, with two copper atoms for each oxygen, barium and yttrium, are between the copper-oxygen planes. In the language of physics, these materials are highly anisotropic: the two-dimensional planes of atoms dominate the structure. Many physicists assumed that the mechanism of superconductivity for these new ma terials might be closely related to this structural anisotropy. Discovery of high-Tc cuprates, the quest for new superconductors has shifted toward more anisotropic, strongly correlated materials with lower carrier densities and competing magnetic and charge-density wave orders. During the past few decades, several new classes of superconductors have been discovered that do not appear to be related to traditional superconductors. The source of the superconductivity of these materials is likely different from the electron-ion interactions that are at the heart of conventional superconductivity. Developing a rigorous theory for any of these classes of materials has proven to be a difficult challenge and will remain one of the major problems in physics in the decades to come.

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Development of Theories to Study the Nature of Superconducting Materials

The new theories can be grouped into two classes. One group assumes weak coupling, whereas a second assumes strong coupling. On the basis of these two assumption number of theory are develop such as; BCS theory (phonon and non-phonon mechanism), Ginzburg-Landau theory of superconductors, Kohn-Sham Theory of Superconductor, McMillan equation, Migdal-Elysburg equations, London Theory, Frohlich Theory, quasi-particle concept, Symmetry in Superconductor, Fluxion Dynamic, Josephson Effect, Density Functional Theory, Andreev Reflection, One gap, two gap, three gap and multigap superconductor, Time reversal symmetry in Superconductor, Orskov equation, Electrodynamics of a Josephson junction, Nonlinear waves in Josephson junctions, weak superconductivity theory, I-V characteristics of a single and multi-fluxion system, Shapiro theory in superconductor, Lagrangian in superconductor, spatial inhomogeneities , Noether current and symmetry breakdown, a potential energy and so on.