

TSC Ferrite International

Definition of a soft ferrite core

Soft Ferrites are ceramic electromagnetic material dark gray or black in appearance and very hard and brittle. The terms "SOFT" has nothing to do with their physical properties but refers to their magnetic characteristics. Soft magnetic materials also called electromagnetic exhibit magnetic properties only when they are subject to a magnetizing force such as the magnetic field created when current is passed through wire surrounding a soft magnetic core. This differs from hard magnetic (Permanent Magnets) in that once a hard magnetic material is magnetized by exposure to a magnetizing force it exhibits magnetic properties permanently.

A Soft Ferrite's magnetic properties arise from interactions between metallic ions occupying particular positions relative to the oxygen ions in its spinel crystalline structure. The magnetic domain theory suggests these interactions create magnetic domains, which are microscopic magnetized regions within the material. When no magnetizing force is present the magnetic domains are random and the net flux contribution is zero even though local domains are fully magnetized. When a magnetizing force is present the magnetic domains align in the direction of the magnetizing force resulting in a large net flux contribution.

Soft Ferrites are also semi-conductors meaning they are somewhere between conductors and insulators in their ability to conduct electron flow through the material.

Advantages Soft Ferrites have over other electro magnetic materials include their inherent high resistivity, which results in low eddy current losses over wide frequency ranges, high permeability and stability over wide temperature ranges. For inductor cores, transformer cores and other applications where electro magnetic materials are required to operate at high frequencies these advantages make Soft Ferrites paramount over all other magnetic materials.

