Answer on Question #69087, Physics / Electromagnetism

Establish the relation B = μ0 (H + M) for a ferromagnetic material.

Solution:

A relationship between magnetic flux density B and external applied magnetic field H:

$$\mathbf{B} = \mu \mathbf{H} \ (1)$$

Magnetic permeability:

$$\mu = (1 + \chi)\mu_0 \ (2)$$

(2) in (1): $\mathbf{B} = (1 + \chi)\mu_0 \mathbf{H} = \mu_0 \mathbf{H} + \mu_0 \chi \mathbf{H} \ (3)$

A relationship between internal magnetization M and external applied magnetic field H:

$$\mathbf{M} = \chi \mathbf{H} \ (4)$$

(4) in (3): $\mathbf{B} = \mu_0 \mathbf{H} + \mu_0 \mathbf{M} = \mu_0 (\mathbf{H} + \mathbf{M})$