Home Problem Set #7 자성재료특강 Due date: 2008년 12월 15일 (월)

1. (a) What criteria are used to distinguish between hard and soft magnetic materials?

(b) In deciding on a material for use in (i) an electromagnet (b) a transformer what magnetic properties would you take into consideration?

2. 다음에 속하는 주요 연자성재료(soft magnetic materials)의 종류(즉 화학식)와 자기적 특성 및 응용분야를 간략히 설명하라

(a) Magnetic Steels

(b) Silicon Steels

(c) Permalloy

(d) Permendur

(e) Amorphous alloys

3. 다음의 ac energy loss의 원인과 loss에 영향을 미치는 주요 인자에 대해 설명하라.

(a) hysteresis loss

(b) classical eddy-current loss

(c) eddy-current loss about a single domain wall

(d) eddy-current loss in multiple domains

4. 다음에 속하는 주요 경자성재료(hard magnetic materials)의 종류(즉 화학식)와 보자력(coercivity)을 향상시킬 수 있는 공정에 대해 설명하시오.

(a) AlNICO

(b) Hexagonal Ferrites

(c) Rare Earth-Transition Metal Intermetallics

(d) Cobalt/Rare-Earth Magnets

(e) Rare-Earth Intermetallics based on $Nd_2Fe_{14}B_1$

5. (a) What is the superparamagnetism? Explain the origin and the condition for its occurrence.

(b) What is random anisotropy in nanostructured materials? Explain two important effects on magnetization.

6. Explain the followings.

(a) Ferromagnetic-antiferromagnetic exchange coupling

(b) Feromagnetic-ferromagnetic exchange coupling

(c) Oscillatory exchange coupling

7. Explain the operation principle and materials examples of

(a) spin valves

(b) spin switches

(c) spin tunneling junctions

(d) spin transfer torque effect