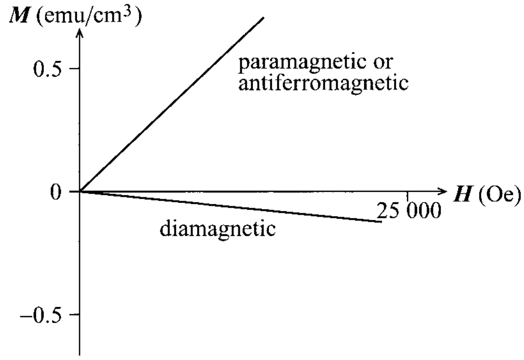

Figure 2.2 Magnetization curves for dia-, para- and antiferromagnets.

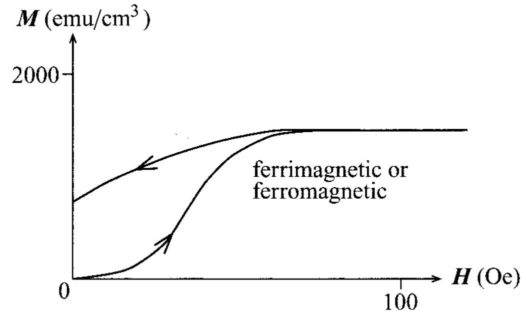

Figure 2.3 Magnetization curves for ferri- and ferromagnets.

The magnetization of dia-, para- and antiferromagnetic materials is plotted schematically as a function of applied field in Fig. 2.2. For all these materials the ***M–H*** curves are linear. Rather large applied fields are required to cause rather small changes in magnetization, and no magnetization is retained when the applied field is removed. For diamagnets, the slope of the ***M–H*** curve is negative, so the susceptibility is small and negative, and the permeability is slightly less than one. For para- and antiferromagnets the slope is positive and the susceptibility and permeability are correspondingly small and positive, and slightly greater than unity respectively.

Figure 2.3 shows schematic magnetization curves for ferri- and ferromagnets. The first point to note is that the axis scales are completely different from those in Fig. 2.2. In this case, a much larger magnetization is obtained on application of a much smaller external field. Second, the magnetization *saturates* – above a certain applied field, an increase in field causes only a very small increase in magnetization. Clearly both χ and μ are large and positive, and are functions of the applied field. Finally, decreasing the field to zero after saturation does not reduce the magnetization to zero. This phenomenon is called *hysteresis*, and is very important

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