

## 5.20: Dielectric Media

*Dielectric* is particular category of materials that exhibit low conductivity because their constituent molecules remain intact when exposed to an electric field, as opposed to shedding electrons as is the case in good conductors. Subsequently, dielectrics do not effectively pass current, and are therefore considered “good insulators” as well as “poor conductors.” An important application of dielectrics in electrical engineering is as a spacer material in printed circuit boards (PCBs), coaxial cables, and capacitors.

Examples of dielectrics include air, glass, teflon, and fiberglass epoxy (the material used in common “FR4” printed circuit boards). These and other dielectrics are listed along with values of their constitutive parameters in Section A1.

The electromagnetic properties of dielectric materials are quantified primarily by relative permittivity  $\epsilon_r$  (Section 2.3), which ranges from very close to 1 upward to roughly 50, and is less than 6 or so for most commonly-encountered materials having low moisture content. The permeability of dielectric materials is approximately equal to the free-space value (i.e.,  $\mu \approx \mu_0$ ); therefore, these materials are said to be “non-magnetic.”

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