Answer to Question #67263, Physics / Electromagnetism

Question: Find the magnitude of the polarization vector P in a dielectric material with ε_r = 2.8 if D = 3.0 X 10-7 C / m2.

Solution: By definition

$$D = \varepsilon_o E + P$$

And also

$$D = \varepsilon_r \varepsilon_o E$$

So

$$E = \frac{D}{\varepsilon_r \varepsilon_o}$$

Then

$$D = \varepsilon_o \frac{D}{\varepsilon_r \varepsilon_o} + P$$

$$P = D(1 - \frac{1}{\varepsilon_r})$$

$$\boldsymbol{P} = 3 * 10^{-7} \left(1 - \frac{1}{2.8}\right) = \boldsymbol{1.929 * 10^{-7} C / m2}$$

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