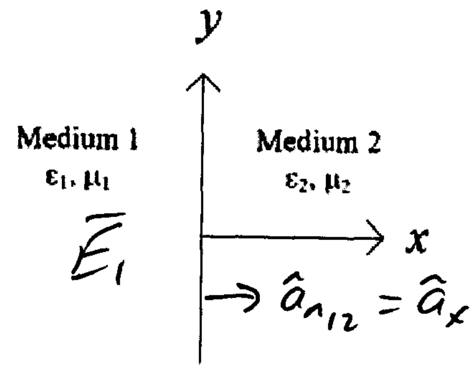
An interface between two media is shown below. If $\bar{E}_1 = \hat{a}_x\alpha + \hat{a}_y\beta + \hat{a}_z\gamma$ at $x = 0^-$, find $\bar{E}_2$ at $x = 0^+$.



Boundary condition problem. Use (9.31a) $E_{1t} = E_{2t}$ and (9.31c) $D_{1n} - D_{2n} = \rho_s$ with the assumption that $\rho_s = 0$.

From the drawing, $\hat{a}_n = \hat{a}_x$ while $\hat{a}_y$ & $\hat{a}_z$ are tangential to the interface.

From (9.31c), $\bar{E}_{2t} = \bar{E}_{1t} = \beta\hat{a}_y + \gamma\hat{a}_z$

From (9.31a) & (9.30a) $\bar{D} = \epsilon\bar{E}$, $\bar{D}_{2n} = \bar{D}_{1n}$. So, we get $\epsilon_2\bar{E}_{2n} = \epsilon_1\bar{E}_{1n} = \epsilon_1\alpha\hat{a}_x \Rightarrow \bar{E}_{2n} = \frac{\epsilon_1}{\epsilon_2}\alpha\hat{a}_x$

$$\bar{E}_2 = \bar{E}_{2n} + \bar{E}_{2t}$$

$$\bar{E}_2 = \frac{\epsilon_1}{\epsilon_2}\alpha\hat{a}_x + \beta\hat{a}_y + \gamma\hat{a}_z$$