③: $$\int \varepsilon \frac{\partial^2 \phi}{\partial x^2} \cdot v \cdot dx + \int (c_+ - c_-) \cdot e \cdot v \cdot dx = 0.$$

$$\int \varepsilon \cdot v \cdot d\left(\frac{\partial \phi}{\partial x}\right) + \int (c_+ - c_-) \cdot e \cdot v \cdot dx = 0.$$

$$\varepsilon \cdot v \cdot \frac{\partial \phi}{\partial x}\Big|_{BO}^{BI} \; \underbrace{- \int \varepsilon \frac{\partial \phi}{\partial x} \cdot v' \cdot dx}_{} + \int (c_+ - c_-) \cdot e \cdot v \cdot dx = 0.$$

no electric current at boundaries

weak form : $$\int \left[(c_+ - c_-) \cdot e \cdot v - \varepsilon \cdot \frac{\partial \phi}{\partial x} \cdot v' \right] \cdot dx = 0.$$

$$0 = \int \left[\varepsilon \cdot \frac{\partial \phi}{\partial x} \cdot v' - (c_+ - c_-) \cdot e \cdot v \right] \cdot dx. \quad \star$$