18.50 This problem asks for us to ascertain which of the materials listed in Table 18.5 are candidates for a parallel-plate capacitor that has dimensions of 38 mm by 65 mm, a plate separation of 1.3 mm so as to have a minimum capacitance of 7 x 10^{-11} F, when an ac potential of 1000 V is applied at 1 MHz. Upon combining Equations 18.26 and 18.27 and solving for the dielectric constant ε_r we get

$$\varepsilon_r = \frac{lC}{\varepsilon_0 A}$$

$$= \frac{(1.3 \text{ x } 10^{-3}\text{ m})(7 \text{ x } 10^{-11}\text{ F})}{(8.85 \text{ x } 10^{-12}\text{ F/m})(38 \text{ x } 10^{-3}\text{ m})(65 \text{ x } 10^{-3}\text{ m})}$$

$$= 4.16$$

Thus, the minimum value of ε_r to achieve the desired capacitance is 4.16 at 1 MHz. Of those materials listed in the table, titanate ceramics, mica, steatite, soda-lime glass, porcelain, and phenol-formaldehyde are candidates.