Question #51486, Chemistry, Physical Chemistry

You are given a gaseous substance. suggest an experimental method to find out whether it is polar or nonpolar. Discuss the steps to be used in this method.

Answer:

There are several ways to determine the polarity of gas molecules. One of them is to determine the dipole moment of the molecule, which can be calculated using the first method Debye.

It is necessary to calculate the dielectric constant of the gas. Can be done by using pre-computed capacitor capacitance of the capacitor with a vacuum between its plates. Next, place the test gas between the plates of the capacitor and then compute capacity.

$$\varepsilon=\frac{C}{C}$$

$$P_M = [(\varepsilon - 1) / (\varepsilon + 2)] \cdot (M / \rho) = (4\pi / 3) \cdot N_A \cdot \alpha$$

According to the Debye formula:

$$P_M = [(\varepsilon - 1) / (\varepsilon + 2)] \cdot M / \rho = (4\pi / 3) \cdot NA \cdot (\alpha_{el} + \alpha_{at} + \boldsymbol{\mu}2 / 3kT).$$