Electric and bond moments of some carbon, silicon and titanium organic compounds
by Walter Katz

A THESIS Submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of Master of Science in Chemistry
Montana State University

Abstract:
A further study of the dielectric end cheated properties of titanium-tetraethylate has been ede. This compound forms aggregates in solution up to approximately a trimer, a type of association which is apparently not based upon hydrogen bonding but rather upon the coordination valence of titanium. X-ray diffractions of titaniumtetraethylete crystals could be used to determine whether this is actually true. The dipole moments of Ti(OC2H5)4, Ti(OC3H7)4, Ti(OC4H9)4, TiCl(OC2H5)3, SiCl(OC2H5)3 end HC(OC2H5)3. were determined in hexane solution at 25°C and. found to be 1.58, 1.32, 1.04, 2.50, 1.75 and 0.7 Debye units respectively. The method used for the determination of the electric moments consisted of measuring the dielectric constants and specific volumes of dilute solutions of the compounds in hexane and extrapolating the resulting straight lines to infinite dilution. The slopes and Intercepts were then used to calculate the molar polarisation from en equation derived by Halverstadt and Kumler (8). The electronic and atomic polarisations were obtained either from refractive index and density measurements of the pure compound or by measuring the refractive Indices of dilute solutions of the compound in hexane solution and using the slope end intercept of the plot of the square of the refractive index against mole fraction in the Halverstadt and Kumler equation. The molar polarisations of titanium tetraethylete at low tea-peretures were a#*cored cad the polarization plotted sgeinet 1/T.

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I. ABSTRACT

A further study of the dielectric and chemical properties of titaniumtetraethylate has been made. This compound forms aggregates in solution up to approximately a trimer, a type of association which is apparently not based upon hydrogen bonding but rather upon the coordination valence of titanium. X-ray diffractions of titaniumtetraethylate crystals could be used to determine whether this is actually true. The dipole moments of $Ti(OC_2H_5)_4$, $Ti(OC_3H_7)_4$, $Ti(OC_4H_9)_4$, $TiCl(OC_2H_5)_3$, $SiCl(OC_2H_5)_3$ and $HC(OC_2H_5)_3$ were determined in hexane solution at 25°C and found to be 1.58, 1.32, 1.04, 2.50, 1.75 and 0.7 Debye units respectively. The method used for the determination of the electric moments consisted of measuring the dielectric constants and specific volumes of dilute solutions of the compounds in hexane and extrapolating the resulting straight lines to infinite dilution. The slopes and intercepts were then used to calculate the molar polarization from an equation derived by Halverstadt and Kumler (8). The electronic and atomic polarizations were obtained either from refractive index and density measurements of the pure compound or by measuring the refractive indices of dilute solutions of the compound in hexane solution and using the slope and intercept of the plot of the square of the refractive index against mole fraction in the Halverstadt and Kumler equation. The molar polarizations of titanium tetraethylate at low temperatures were measured and the polarization plotted against 1/T.