TEXT 1

Gas chromatography

Gas chromotography is a method for separating components of mixtures of volatile compounds. In most applications the separations are made to identify 88 and determine the quantity of each component of a sample of the mixture, and analytical gas chromatographic apparatus includes additional devices for this purpose. In some applications, separations are made for preparative purposes, but the scale is not generally greater than that required for quantities of the order of 100 g. The central item in the apparatus for gas chromatography is the chromatographic column, a long tube packed permeably with some adsorbent. In the commonest technique of gas chromatography, the elution technique, a stream of inert gas, the carrier gas, passes continuously through the column, and the mixture to be separated is introduced at the beginning of the column as a sample either of a gas or a volatile liquid. Let us suppose that the sample consists of one pure component. After introduction, it is swept by the carrier gas on to the column, first evaporating to form a vapor if it is introduced as a liquid. When it reaches the column, it is largely adsorbed, but the equilibrium is set up between the column and the gas in the interstices of the column so that a proportion of the sample always remains in the gas phase. This portion moves a little further along the column in the carrier gas stream, where it again equilibrates with the column. At the same time, material already adsorbed in the column reenters the gas phase so as to: restore equilibrium with the clean carrier gas which follows up the zone of vapor. The speed at which the zone moves depends on 89 two factors, the rate of flow of the carrier gas and the extent to which the vapor is adsorbed. The faster the flow of carrier gas, the faster the zone moves; and the more strongly the vapor is adsorbed on the column, the more slowly the zone moves. When two or more components are present in the sample, each usually behaves, independently of the others so that for a given carrier gas flow rate, the speed of the zone of each component will depend on the extent to which it is adsorbed. Since different substances differ in their adsorption, they may therefore be separated by making use of their different speeds of progress through the column. If they are eluted to the far end of the column they will appear one after the other in the gas stream, the fastest first and the slowest last. Adsorbents such as carbon, alumina, or silica gel are used as the packing material for columns, but in more than 90% of applications, the column material is a liquid held in place on the column by being adsorbed on an inert solid support. Gas chromatography with this kind of column is called Gas Liquid Chromatography (G.L.C.). This method is used for separating solutes from mixed solutions.