Table 1. EFFECT OF MONOLAYERS ON EVAPORATION RATE IN VARYING CONDITIONS OF CONVECTION

Conditions		v (g cm^{-2} s^{-1})	% Reduction by monolayer	x cm (calculated from equation 1)	x cm (from temp. gradient)
Tube with 6·2 cm air column	No monolayer	$3·59 \times 10^{-7}$		6·25	
	Hexadecanol	$3·59 \times 10^{-7}$	0	6·25	
Natural Convection	No monolayer	$1·65 \times 10^{-6}$		1·30	$1·2 \pm 0·1$
	Hexadecanol	$1·40 \times 10^{-6}$	15	1·55	$1·6 \pm 0·1$
Mild air circulation	No monolayer	$3·72 \times 10^{-6}$		0·56	$0·6_5 \pm 0·1$
	Hexadecanol	$2·35 \times 10^{-6}$	37	0·90	$0·9_5 \pm 0·1$
Moderate air circulation	No monolayer	$1·49 \times 10^{-5}$		0·12	$< 0·2$
	Serum albumin	$1·49 \times 10^{-5}$	0	0·12	
	Hexadecanol	$4·90 \times 10^{-6}$	67	0·42	$0·3_5 \pm 0·1$

calculated by the two independent methods confirms that the hexadecanol monolayer acts by resisting the reduction of the stagnant layer thickness by the air currents. The temperature gradient measured in the water phase (Fig. 2) obviously reflects the presence of convection currents. The measurements are not sensitive enough to detect the stagnant layer in the water phase, which therefore must be at least an order of magnitude less in thickness than in the gaseous phase. A comparison of a serum albumin monolayer, which is characterized by a very high surface visco-elasticity and low surface compressional modulus[10], with hexadecanol, which has a high surface compressional modulus, suggests that the latter is the important factor in dissipating eddy currents near the interface, thus producing thicker diffusion layers.

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[1] *Retardation of Evaporation by Monolayers* (edit. by La Mer, V. K.), (Academic Press, New York, 1962).
[2] La Mer, V. K., Healy, T. W., and Aylmore, L. A. G., *J. Colloid Sci.*, **19**, 673 (1964).
[3] Lewis, W. K., and Whitman, W. G., *Ind. Eng. Chem.*, **16**, 1215 (1924).
[4] Lewis, J. B., *Chem. Eng. Sci.*, **3**, 248, 260 (1954).
[5] Linton, M., and Sutherland, K. L., *Proc. Second Intern. Cong. Surface Activity*, **1**, 494 (1957).
[6] Davies, J. T., and Rideal, E. K., *Interfacial Phenomena*, 266 (Academic Press, London, 1961).
[7] Seimiya, T., and Sasaki, T., *J. Colloid Sci.*, **21**, 229 (1966).
[8] *Handbook of Chemistry and Physics*, 2213 (Chemical Rubber Publishing Co., Cleveland, 1960).
[9] *Handbook of Chemistry and Physics*, 2448 (Chemical Rubber Publishing Co., Cleveland, 1960).
[10] Davies, J. T., and Rideal, E. K., *Interfacial Phenomena*, 265 (Academic Press, London, 1961).

Application of the Gunn Effect in Electron Spin Resonance Measurements

THE standard method of making electron spin resonance measurements is to mount the specimen in a cavity which is resonant at the microwave measuring frequency and which is energized by a separate klystron oscillator. Electron spin resonance in the specimen is detected by means of the changes which are caused in the reflexion coefficient or the transmission coefficient of the cavity. A review of these methods is given in ref. 1.

In the field of nuclear magnetic resonance the measuring frequencies are in the radio-frequency region rather than the microwave region. Measuring methods analogous to those given may be employed, with the specimen mounted in an inductor which forms part of a resonant circuit energized by a separate rf oscillator. On the other hand, there is another type of measuring technique which is widely used in situations where the highest resolution is not required. This involves incorporating the specimen coil in the tank circuit of an oscillator operating in such a mode that the level of oscillation is sensitive to changes in the Q factor of the tank circuit. These self-oscillating detection systems fall into two principal categories, depending on whether they employ a conventional oscillator circuit operating in marginal conditions, or the more recent Robinson[2] arrangement in which the tank circuit is fed through a high impedance from a voltage limiter or alternatively[3] from a pair of transistors acting as a current switch.

The great advantages of a self-oscillating detection system are that the oscillation frequency is automatically equal to the resonance frequency of the tuned circuit containing the specimen, and that it responds only to changes in the imaginary component of the susceptibility of the specimen, changes in the real component being automatically compensated by slight shifts in the oscillation frequency. Setting-up is therefore very simple; also a continuous frequency sweep can easily be introduced because there are no tracking problems.

Until recently it has not been practicable to build self-oscillating detectors for the microwave region because of the lack of suitable devices. The recent availability of Gunn diodes, however, has made it possible to construct a Robinson oscillator for the X-band region, and such an oscillator has been built in this laboratory. It consists of a resonant cavity in No. 16 waveguide, with one end closed by a normal short-circuit and the other by a 3 mm brass post incorporating a Plessey Gunn diode. The specimen is mounted at one of the points of maximum microwave magnetic field. Microwave power is coupled out past the post into an HPA hot-carrier diode detector, connected to a standard Brookdeal low-noise amplifier and phase-sensitive detector.

The signal/noise ratio from this system is comparable with that from an electron spin resonance spectrometer of conventional design, although it can be built for a small fraction of the cost. Setting-up is incomparably easier because no adjustment at all is necessary when a specimen is introduced into the cavity; the oscillation frequency automatically shifts to allow for the perturbation caused by the specimen, and the system is always in the absorption-sensitive mode.

It seems likely that this technique (which is the subject of a patent application) will enable spin resonance to be used to a much greater extent than it has been in the past in process control and routine industrial measurements. It is also applicable to other situations where on-line measurements of microwave absorption are required, for instance, in the control of humidity. Details of the construction of the cavity, and a detailed evaluation of the sensitivity, will shortly be published.

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[1] Faulkner, E. A., *Lab. Practice*, **13**, 1065 (1964).
[2] Robinson, F. N. H., *J. Sci. Inst.*, **36**, 481 (1959).
[3] Faulkner, E. A., and Holman, A., *J. Sci. Inst.*, **44**, 391 (1967).

Temperature Dependence of Adsorption Isotherms of Primary Alcohols at the Liquid-air Interface

IN this communication, we report data on the temperature dependence of surface pressure as a function of concentration for butan-1-ol, hexan-1-ol, and octan-1-ol in aqueous solution. The results are presented in Figs. 1–3.

Surface tension was measured at 10° C, 25° C and 40° C by the drop volume method, using a stainless steel tip. The results had a reproducibility of at least 0·06 dyne cm^{-1}, except at 40° C for high concentrations of octan-1-ol, for which the reproducibility was at least 0·1 dyne cm^{-1}. The volume of the Agla micro-syringe at different temperatures was determined using mercury; the diameter of