JOURNAL OF THE AMERICAN CHEMICAL SOCIETY
J. Am. Chem. Soc., 1997, 119(11), 2765-2766, DOI:10.1021/ja964103m

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Preparation of Cellulose Triacetate (CTA) Membranes. Cellulose triacetate (CTA, 0.10 g), plasticizer (2-NPOE or TBEP, 0.20 g), and transporter (0.20 g) were dissolved in 5 mL chloroform. The solution was allowed to slowly evaporate overnight at room temperature in a 9 cm diameter flat-bottomed glass petri dish that was loosely covered. The membrane was carefully peeled away from the dish to give a 50 μm thick transparent film which was trimmed and clamped into the transport cell. The transport cell consisted of two identical, water-jacketed cylindrical halves (half-cell volumes 60 mL, membrane area 16 cm^2) that were stirred by turbines, which in turn were driven by externally situated magnets. The side of the film exposed to the air during the evaporation process was placed facing the source solution.

Typical Transport Experiment. Both aqueous phases contained sodium phosphate buffer solution (60 mL, 100 mM, pH 7.3) maintained at 25 °C. In addition, the source phase contained saccharide (300 mM). The amount of saccharide appearing in the receiving phase was determined by enzymatic assay of small aliquots (usually 0.5 mL). The initial fluxes were determined by extrapolating to t = 0. Glucose levels were determined using the standard mixed enzyme system of hexokinase/glucose-6-phosphate dehydrogenase (1 unit of each enzyme). The appearance of NADPH was monitored by its absorption at 340 nm (ε = 6230 $M^{-1}cm^{-1}$). The fructose assay used the same enzymes for glucose detection plus phosphoglucoisomerase. The sucrose assay used the same enzymes for fructose detection plus invertase.

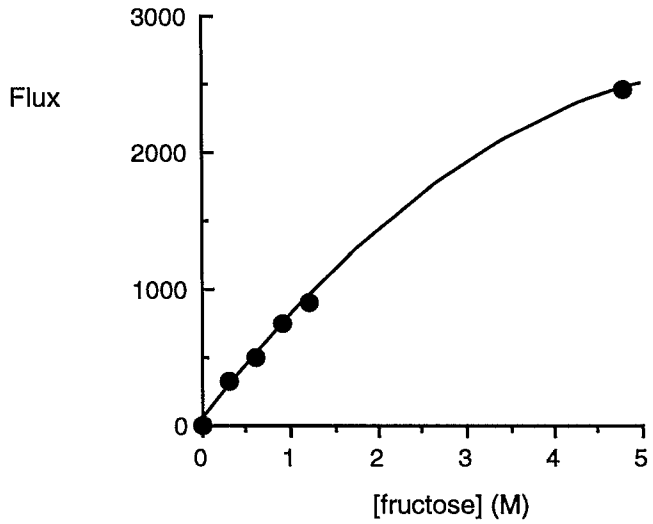

Figure 1. Fructose flux (mol/m^2s) as a function of fructose concentration in the source phase. Both aqueous phases contained sodium phosphate (60 mL, 100 mM, pH 7.3). The plasticized membrane (16 cm^2, 40 μm thick) was manufactured from CTA (0.10 g), TOMAC (0.10 g), 2-NPOE (0.20 g), T = 298 K.

Transport Through Supported Liquid Membranes

The transport cell was the same as above, however, the membrane was a thin sheet of microporous polypropylene (Celgard 2500™, thickness 25 μm) that supported a solution of TOMAC in 2-NPOE. A plot of fructose flux versus % wt TOMAC is shown in Figure 2. The curve is rationalized in terms of two competing transport pathways with carrier-diffusion dominating at low TOMAC concentration and fixed-site jumping dominating at high TOMAC concentrations. Below the TOMAC percolation threshold of 20 % wt or 0.5 M, fructose transport through the liquid membrane occurs by carrier-diffusion and a linear relationship is observed. This is reasonable because the lower viscosity associated with a liquid membrane makes carrier-diffusion a more favorable process than with a plascticized membrane which is impermeable when TOMAC is below 20 % wt. Above the 20 % threshold the non-linear effects of fixed-site jumping are seen in both membranes. The jump step is an exchange of sugar between complexed and uncomplexed TOMAC (*i.e.*, rate of jumping is proportional to [sugar-TOMAC complex] x [uncomplexed TOMAC]). Thus, flux exhibits a second-order dependence on TOMAC concentration.

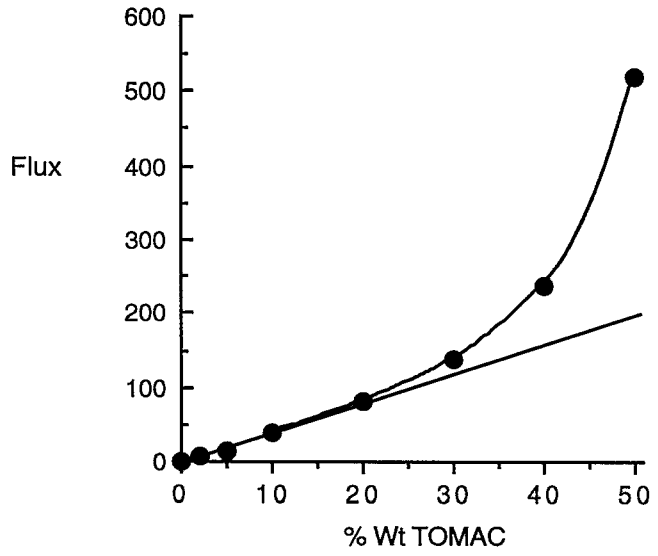

Figure 2. Fructose Flux (mol/m^{2}s) versus % Wt TOMAC for a liquid membrane that also included 2-NPOE. The liquid membrane was supported by a 25 μm thick sheet of Celgard 2500™. Both aqueous phases contained sodium phosphate (60 mL, 100 mM, pH 7.3). The source phase also contained fructose (300 mM).