

A Comparative Study to Evaluate the Diffusion of Anionic Chemical Compounds

Keywords: Phoenix RDS, Robotic Diffusion Station, Anionic Aromatic Organic Compound, Nafion Membrane, Glucose Limiting Membrane, HPLC, Cations, Anions, Glucose Permeation, Blood Sugar Levels, Medical Device, Diffusion Study

A novel study was performed using a Hanson Phoenix RDS (Robotic Diffusion Station) from Teledyne LABS to evaluate the released profile of an anionic aromatic organic compound through a Nafion membrane and a glucose limiting membrane (GLM).

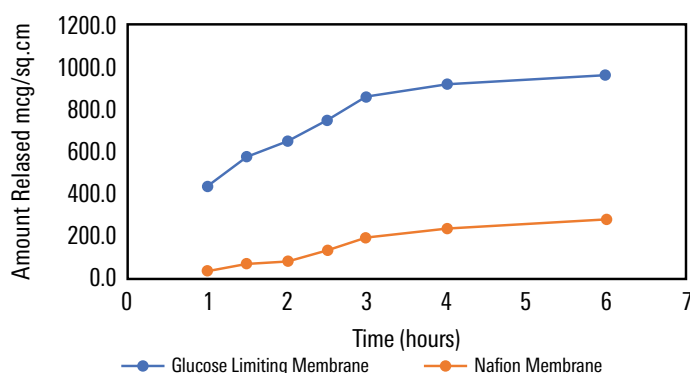
This 6-hour study used a liquid sample containing 30 mg/mL of an active substance in phosphate buffered solution. 15 mL medium size vertical diffusion cells, with donor chambers having 1.5 cm orifices, were used for this study. The cells were maintained at 32 ± 1 °C at 400 rpm stirring speed. Collected samples were quantified by a chromatographic method on HPLC. Nafion membranes are made from a copolymer of perfluoro sulfonic acid (PFSA) and polytetrafluoroethylene (PTFE). The membranes are permeable to cations but block anions.

When an electric charge is applied across the membrane, cations pass from one compartment to the other, while anions remain behind. It is used as a coating for biosensors that control the rate of glucose permeation and for glucose sensors that monitor blood sugar levels. It also helps reduce the number of interfering agents that affect the sensor's accuracy.

Amount Released Micrograms/sq.cm

Time (hours)	Glucose Limiting Membrane Avg. Released	%RSD	Nafion Membrane Avg. Released	%RSD
1	437.8	1.1	38.9	5.5
1.5	578.5	3.8	66.0	16.5
2	652.4	5.0	79.0	8.0
2.5	751.6	2.7	136.2	6.3
3	860.3	3.4	191.7	4.1
4	918.2	4.6	233.1	5.7
6	958.8	5.4	270.2	0.2

Released Profile of GLM vs Nafion Membrane



Conclusion

It is determined that the Nafion membrane blocked the diffusion of anionic compound through the membrane while the active ingredient passed through GLM easily and rapidly. This study is applicable for the medical device industry. Teledyne LABS' Phoenix RDS automated diffusion apparatus is a very useful tool for conducting a diffusion study involving dialysis and in other related areas.

