Study for Effect of a Higher-Order Field on Ionic Transport across a Membrane

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The higher-order field for membrane transport is consider as the field which is not concerning with the motive force of the membrane transport such as concentration, hydraulic pressure or electric field. The following cases are considered to be higher-order filed.

1) Electric field parallel to the amphoteric membrane surface
2) Electromagnetic field
3) Ultrasonic wave
4) Low-frequency wave
5) Laser
6) Jet flow
7) Reaction field by TiO_2
8) Reaction field by microorganism

In this study we focused to the field which is generated by the low-frequency wave because it has not been studied in the membrane transport phenomena. Three kind of membranes are prepared, that is, pure a PVA membrane, a PVA/Sericine-blended membrane, and commercial ion-exchange membrane (K101; Asahi Chemicals). The NaCl transports were measured across those membranes under the low-frequency wave field and without the field, and both cases were compared. In the case, where the low-frequency wave is not applied, the membrane transport cell is stirred by stirrers. It was evidenced that two significant effects were observed if the low-frequency wave was applied. One is the observation of long time lag for all membranes and the other is the higher NaCl permeability coefficient across a PVA/Sericine-blended membrane. This study suggests the effect of a higher-order field (low-frequency wave) on ionic transport across a membrane.