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Transport of dilute organics through dense membranes: assessing impact on membrane-solute interactions

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Abbreviations

$c_{i,bulk}$ - concentrations of the solute *i* in the bulk (-)

$c_{i,bl}$ - concentrations of the solute *i* in the boundary layer (-)

$c_{i(m)}^{perm}$ - concentrations of the solute *i* in the membrane in the permeate (-)

c_i^{perm} - concentrations of the solute *i* in the permeate (-)

$c^*_{i,m}$ - equilibrium concentration in the membrane (wt./wt.)

$c^*_{i,f}$ - equilibrium concentration in the liquid (wt./wt.)

D_{i-j} - diffusion coefficient of the solute in the solvent calculated using the Wilke-Chang equation ($m^2\ s^{-1}$)

D_i – diffusion coefficient of the solute *i* ($m^2\ s^{-1}$)

$D_i(t)$ - time-dependent diffusion coefficient($m^2\ s^{-1}$)

$D(t=\infty)$ – diffusion coefficient of compound *i* at the steady state ($m^2\ s^{-1}$)

EF (-) – enrichment factor

EtAc – ethyl acetate

HxAc – hexyl acetate

H_i - Henry's law coefficient (Pa^{-1})

$I_i(t)$ - electrical signal intensity of the compound *i* in the instant *t* [A]

$I_i(t=\infty)$ - electrical signal intensity of the compound i at the steady state ($t=\infty$)

$J_{i,bl}$ - flux across the boundary layer ($m^{-3}\ m^{-2}\ s^{-1}$)

$J_{i,m}$ - flux across the membrane ($m^{-3}\ m^{-2}\ s^{-1}$)

$J_{i,ov}$ – overall flux ($m^{-3}\ m^{-2}\ s^{-1}$)

J_i - partial flux of the compound i ($m^{-3}\ m^{-2}\ s^{-1}$)

J_T - the total flux ($m^{-3}\ m^{-2}\ s^{-1}$)

$Ji(t=\infty)$ - partial flux in the steady state ($m^{-3}\ m^{-2}\ s^{-1}$)

$k_{i,bl}$ – boundary layer mass transfer coefficient ($m\ s^{-1}$)

$k_{i,ov}$ – overall mass transfer coefficient ($m\ s^{-1}$)

$k_{i,m}$ - membrane mass transfer coefficient ($m\ s^{-1}$)

z_{bl} - boundary layer thickness (m)

L - thickness of the membrane (m)

P - permeability of a solute i ($m^2\ s^{-1}$)

P_i^G - gas-phase permeability of compound i. ($m^2\ s^{-1}$ Pa)