Dear Editor

Regarding errors TS2 and TS3 in the manuscript, there was an error in copying the mobility value from Table 1 in Varcoe et al. In TS2 comment, instead of we wrote . In the text (comment TS3), we did not change the mobility value to centimeters and it is written as , which is the correct value for meters; however, for centimeters, it should be []. These errors do not reflect on our calculation, as can be seen from the program and the calculation outcome.

Therefore, I apologize for this change, yet it does not change the outcome of the calculation or any result in our work.

function fluxes = nernst\_planck\_fluxes\_with\_mobility(initial\_pH, final\_pH, temperature, distance)

% Nernst-Planck calculation for H+, OH-, and Na+ fluxes using known ionic mobility.

% Inputs:

% - initial\_pH: initial pH value

% - final\_pH: final pH value

% - temperature: temperature in Celsius

% - distance: distance between fluid regions in cm

% Constants

R = 8.31447; % Ideal Gas constant in J/(mol K)

F = 9.6485e4; % Faraday constant in C/mol

k = 1.38e-23; % Boltzmann constant in J/K

e = 1.602e-19; % Elementary charge in Coulombs

T = temperature + 273.15; % Temperature in Kelvin

pOH\_25C = 14; % pKw at 25°C is 14

% Ion valences (z)

z\_H = 1;

z\_OH = -1;

z\_Na = 1;

% Ionic mobility in cm^2/V/s (typical values at 25°C)

u\_H = 36.2e-4; % H+ mobility

u\_OH = 20.64e-4; % OH- mobility

u\_Na = 5.19e-4; % Na+ mobility

% Calculate ion concentrations from pH and pOH values

initial\_H\_concentration = 10^(-initial\_pH);

final\_H\_concentration = 10^(-final\_pH);

initial\_OH\_concentration = 10^(-(pOH\_25C - initial\_pH));

final\_OH\_concentration = 10^(-(pOH\_25C - final\_pH));

initial\_Na\_concentration = initial\_OH\_concentration; % Assuming Na+ matches OH-

final\_Na\_concentration = final\_OH\_concentration;

% Diffusion flux calculation (using D = u \* k \* T / e)

D\_H = u\_H \* k \* T / e;

D\_OH = u\_OH \* k \* T / e;

D\_Na = u\_Na \* k \* T / e;

% Diffusion flux calculation

J\_H\_diffusion = -D\_H \* (final\_H\_concentration - initial\_H\_concentration) / distance;

J\_OH\_diffusion = -D\_OH \* (final\_OH\_concentration - initial\_OH\_concentration) / distance;

J\_Na\_diffusion = -D\_Na \* (final\_Na\_concentration - initial\_Na\_concentration) / distance;

% Electric potential difference calculation using Nernst equation for each ion

E\_H\_v\_cm = -(R \* T / (z\_H \* F))\*100

E\_OH\_v\_cm = -(R \* T / (z\_OH \* F)) \* 100

E\_Na\_v\_cm = -(R \* T / (z\_Na \* F)) \* 100

E\_H = -(E\_H\_v\_cm) \* log(final\_H\_concentration / initial\_H\_concentration)

E\_OH = -(E\_OH\_v\_cm) \* log(final\_OH\_concentration / initial\_OH\_concentration)

E\_Na = -(E\_Na\_v\_cm) \* log(final\_Na\_concentration / initial\_Na\_concentration)

% Total electric potential difference

E\_total = E\_H + E\_OH + E\_Na;

% Flux due to electric potential gradient using ionic mobility

J\_H\_electric = u\_H \* z\_H \* e \* initial\_H\_concentration \* E\_total / distance;

J\_OH\_electric = u\_OH \* initial\_OH\_concentration \* E\_OH / distance;

J\_Na\_electric = u\_Na \* z\_Na \* e \* initial\_Na\_concentration \* E\_total / distance;

% Total fluxes (diffusion + electric potential contribution)

J\_H\_total = J\_H\_diffusion + J\_H\_electric;

J\_OH\_total = J\_OH\_diffusion + J\_OH\_electric;

J\_Na\_total = J\_Na\_diffusion + J\_Na\_electric;

% Store fluxes in a struct

fluxes.H = struct('diffusion', J\_H\_diffusion, 'electric', J\_H\_electric, 'total', J\_H\_total);

fluxes.OH = struct('diffusion', J\_OH\_diffusion, 'electric', J\_OH\_electric, 'total', J\_OH\_total);

fluxes.Na = struct('diffusion', J\_Na\_diffusion, 'electric', J\_Na\_electric, 'total', J\_Na\_total);

% Display results

fprintf('Electric potential difference (V): %.6f\n', E\_total);

fprintf('H+ Flux - Diffusion: %.3e, Electric: %.3e, Total: %.3e (mol/cm^2/s)\n', ...

fluxes.H.diffusion, fluxes.H.electric, fluxes.H.total);

fprintf('OH- Flux - Diffusion: %.3e, Electric: %.3e, Total: %.3e (mol/cm^2/s)\n', ...

fluxes.OH.diffusion, fluxes.OH.electric, fluxes.OH.total);

fprintf('Na+ Flux - Diffusion: %.3e, Electric: %.3e, Total: %.3e (mol/cm^2/s)\n', ...

fluxes.Na.diffusion, fluxes.Na.electric, fluxes.Na.total);

end

% Example call to the function with sample values

initial\_pH = 7.3;

final\_pH = 12.3;

temperature = 25; % Celsius

distance = 0.05; % cm

% Call the function and calculate fluxes

fluxes = nernst\_planck\_fluxes\_with\_mobility(initial\_pH, final\_pH, temperature, distance);

% nernst\_planck calc outcome

E\_H\_v\_cm = -2.5693

E\_OH\_v\_cm = 2.5693

E\_Na\_v\_cm = -2.5693

E\_H = -29.5798

E\_OH = -29.5798

E\_Na = 29.5798

Electric potential difference (V): -29.579803

H+ Flux - Diffusion: 9.319e-11, Electric: -1.719e-26, Total: 9.319e-11 (mol/cm^2/s)

OH- Flux - Diffusion: -2.115e-05, Electric: -2.436e-07, Total: -2.140e-05 (mol/cm^2/s)

Na+ Flux - Diffusion: -5.319e-06, Electric: -9.814e-27, Total: -5.319e-06 (mol/cm^2/s)