



## Donnan membrane equilibrium studies of mercury salts with Nafion-117 membrane

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### ABSTRACT

The Donnan membrane equilibrium experiments using two compartment cell have been carried out to understand the effect of speciation on the transport behavior of mercury ion through Nafion-117 ion-exchange membrane. The mercury ions have been observed to rapidly permeate to Cl<sup>-</sup> side from Hg(NO<sub>3</sub>)<sub>2</sub> solution, showing the extraordinary preference of mercury ions for Cl<sup>-</sup> ion in aqueous solution. On the other hand, from HgCl<sub>2</sub> solution, slow permeation of mercury ions through the membrane has been observed. Also the transport of mercury ion from HgCl<sub>2</sub> solution has been found to be higher than expected based on Donnan membrane equilibrium principle considering the ionic concentration of HgCl<sub>2</sub> calculated using speciation diagram. This has been attributed to the leakage of neutral HgCl<sub>2</sub> molecules through the membrane. The leakage of neutral HgCl<sub>2</sub> species through Nafion-117 membrane has been confirmed in different cationic forms of the membrane. An attempt has been made to determine the concentration of cationic mercury species in aqueous HgCl<sub>2</sub> solution using conditions of Donnan membrane equilibrium. The total cationic mercury species has been found to be higher than that predicted by speciation calculations.

*Keywords:* Mercury Speciation; donnan equilibrium; ion-exchange; Nafion-117; Hg(NO<sub>3</sub>)<sub>2</sub>; HgCl<sub>2</sub>

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