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Asymmetry induced electric current rectification in permselective systems YOAV GREEN, YARON EDRI, GILAD YOSSIFON, TECHNION
— Permselective systems are inherently asymmetric as they have preference to the transport of one charge carrier over the other. In this work we derive a solution for the concentration distribution, electric potential and current-voltage response for a four-layered system comprised of two microchambers connected by two permselective regions of varying properties. We show that any additional asymmetry in the system, in terms of the geometry, bulk concentration, or surface charge property of the permselective regions, results in rectification of the current. Our work is divided in two parts, when both permselective regions have the same sign surface charge sign and the case of opposite signs. For the same sign case we are able to show that the system behaves as Dialytic battery. For the case of opposite signs, our system exhibits the bipolar behavior of a diode where the magnitude of the rectification can be of order $O(100-1000)$.

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