Anomalous X-ray diffraction studies of ion transport in Potassium channels

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Potassium ion channels utilize a highly selective filter to rapidly transport potassium ions across cellular membranes. This selectivity filter is composed of four binding sites which display almost equal electron density in crystal structures with high potassium ion concentrations. This electron density can be interpreted to reflect a superposition of alternating potassium ion and water occupied states or as adjacent potassium ions. We used single wavelength anomalous dispersion (SAD) X-ray diffraction data (Langan *et al* 2018) collected near the potassium absorption edge to show experimentally that all ion binding sites within the selectivity filter are fully occupied by K+ ions. These data support the hypothesis that potassium ion transport occurs by direct Coulomb knock-on and provide the first example of solving the phase problem by K-SAD.

Langan, P.S., Vandavasi, V.G., Weiss, K.L., Afonine, P.V., Omari, K.E., Duman, R., Wagner, A. Coates, L. “Anomalous X-ray diffraction studies of ion transport in K^+ channels” Nature Communications Volume 9, Article number: 4540 (2018)