Towards early diagnosis of Alzheimer's disease via volatile organic compound detection using ionic liquid-based electrochemical sensors

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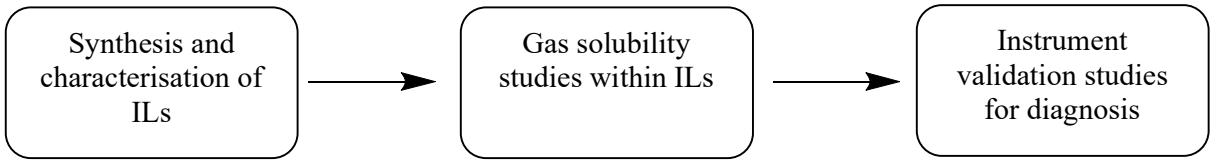
Early diagnosis of Alzheimer's disease (AD) is critical to the improvement of patient outcomes and quality of life. However, current diagnostic methods, such as spinal taps and brain imaging, are invasive, costly, and often distressing for patients.

Breath-based volatile organic compound (VOC) analysis from has emerged as a promising rapid, non-invasive alternative to detect presymptomatic AD.[1] Recent studies have identified VOCs such as pyrrole and ethanol as potential early biomarkers. Concentrations of benzene were also shown to have a strong correlation to severity of dementia.[2]

Ionic liquids (ILs) are known to improve the sensitivity of electrochemical sensors by promoting favourable interactions between redox-active analytes and the ionic species within the bulk medium. In particular, π-π stacking and other intermolecular interactions may be leveraged to improve the sensitivity and selectivity of electrochemical sensors towards AD-related VOCs.

This work aims to develop novel sub-micro ionic liquid-based electrochemical sensors for the selective detection of VOC biomarkers associated with Alzheimer's disease.



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Andrew Wilson is a first-year PhD student in Chemistry at the University of Otago, focusing on electrochemical gas sensing. He graduated with a BSc in Chemistry and a minor in Mathematics in 2023, followed by a BSc (Hons) first class in Chemistry in 2024 developing analytical instruments to detect non-polar lipids in microalgae.