Enzymatic doped ionogels - new materials for inherently biocompatible molecular sensors

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Introduction:
- The key challenges currently faced in lab-on-a-chip biochemical sensor developments are device reliability and power consumption.
- Point-of-care (POC) glucose biosensors play an important role in the management of blood sugar levels in patients with diabetes. Glucose biosensors still account for approximately 85% of the current world market which is estimated to be worth $5 billion.[3]
- Ionic liquids (ILs) have evolved as a new type of solvent for biocatalysis, mainly due to their unique and tunable physical properties.[2]

Project Aims:
- Enzymatic doped Ionic Liquids - new materials for inherently biocompatible molecular sensors.
- Develop a flexible, wearable biocompatible molecular sensor.

Ionic liquids: An introduction
- Ionic liquids (ILs) are low melting salts, thus forming liquids that are comprised entirely of cations and anions.
- According to current convention, a salt melting below the normal boiling point of water (> 100 °C) is known as an “ionic liquid”.
- The number of potential anion-cation combinations available reputedly equate to one trillion (10^12) different ILs.
- Vast range of applications such as in green chemistry, electrochemistry & biotechnology (Fig 1).

Results & Discussion:

Electrochemical sensing:
- SEM image (Fig 4) shows excellent coverage of the threads resulting in a large working surface area. Using the Anson equation, the calculated working area was approx 0.138 cm².
- Due to the hydrophobic nature of the cloth, [P_{6,6,6,14}][dca] was chosen as the electrolyte.
- Significant response shown at 7.5 mM glucose addition (Fig 5).

Conclusions:
- Carbon cloth shows potential as a flexible working electrode.
- Can be woven into sports athletes clothing.
- Durable, flexible sensing platform.
- [P_{6,6,6,14}][dca] as an electrolyte in the glucose system shows low limit of detection.

References

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