FROM NATURE FOR NATURE: SUPPORTING THE DEVELOPMENT OF STIMULUS-RESPONSIVE IONOGELS FOR AGROCHEMISTRY

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BACKGROUND

Ionic liquids are salts with extremely low vapor pressure. Conventionally, the criteria to distinguish it from molten salts are (1) purity and (2) a melting point below 100 °C.

other properties
- high solvation
- nonflammable
- can come from renewable sources

Ionogels are any ionic liquid-containing materials irrespective of the nature of the gelator (*i.e.* supramolecular, polymeric, colloidal).

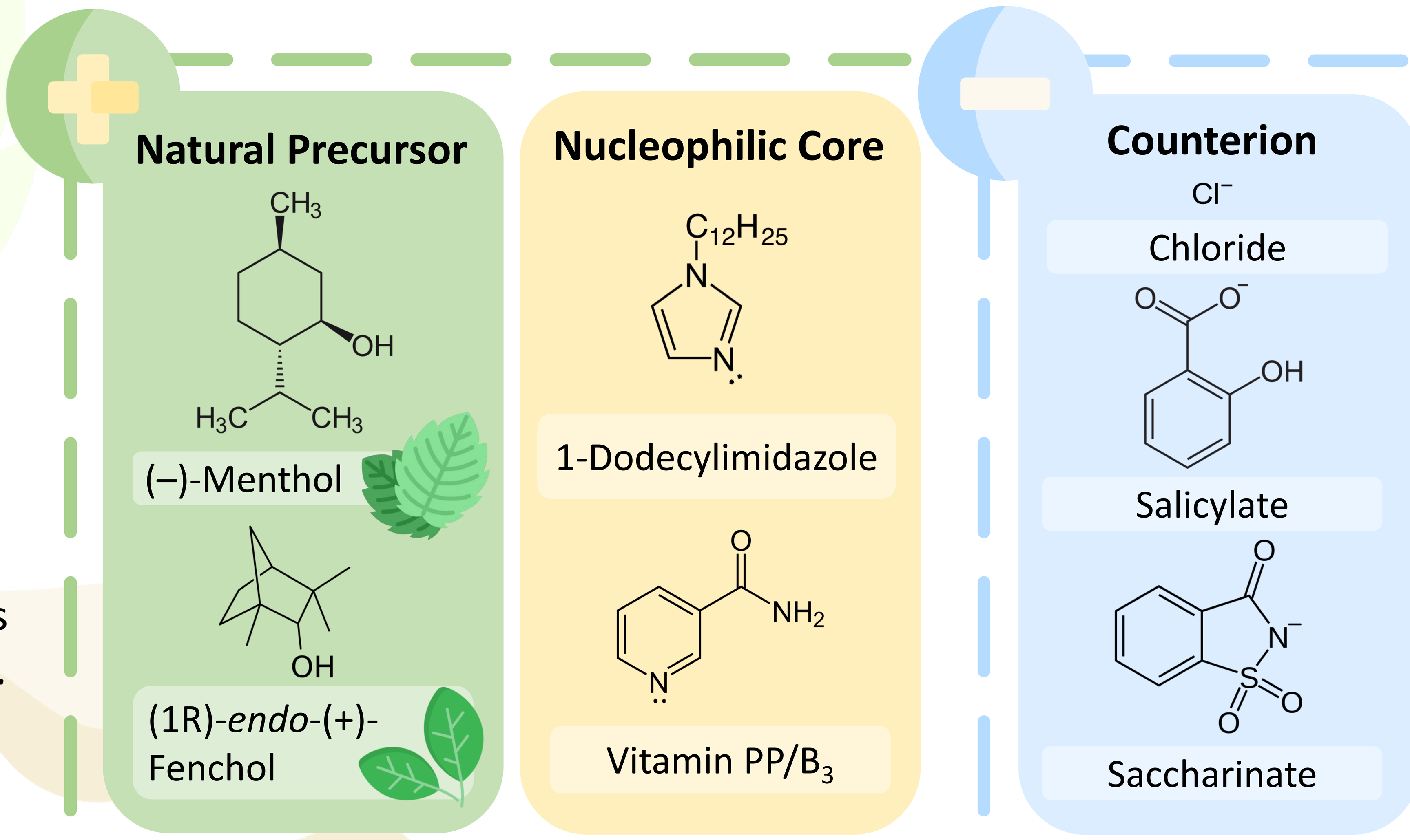


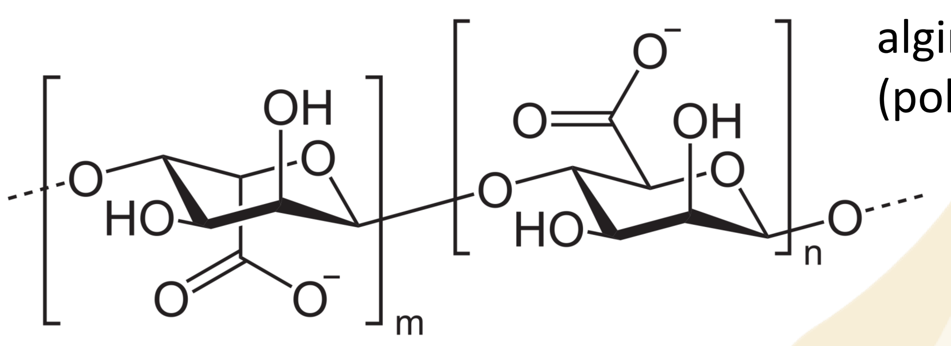
Figure 1. Components of bioderived ionic liquids.

MOTIVATION

Task-specific ionic liquids (TSILs) are proving to be one of the most promising alternatives for mitigating the growing resistance of microbes to antiseptics.

Polymeric Ionogels can be created to increase stability and to facilitate effective transport of the dispersed liquid phase.

METHODOLOGY



Step 1: *Amidation of Prepolymer*

Step 2: *Crosslinking and Work-up*

Step 3: *Sorption of Ionic Liquid*

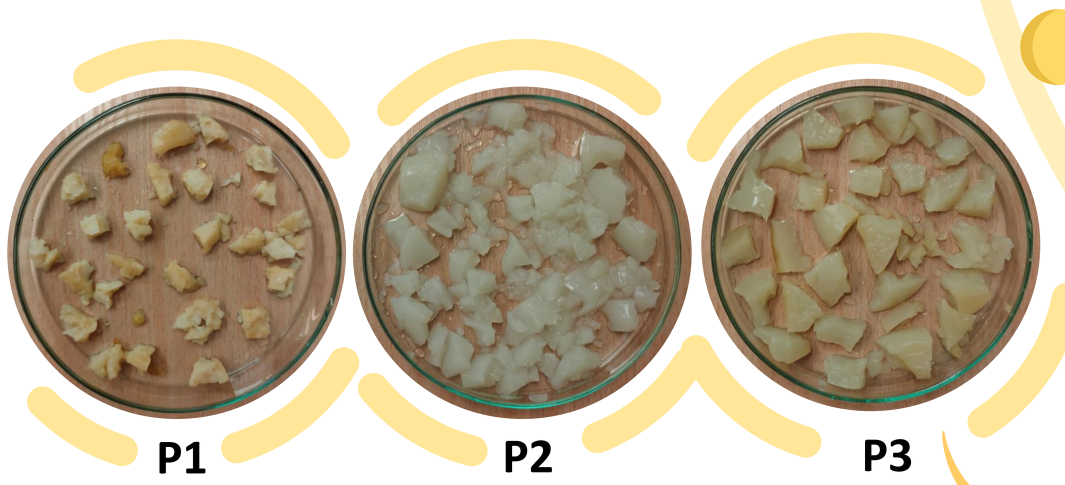


Image 1. Swollen polymer matrices.

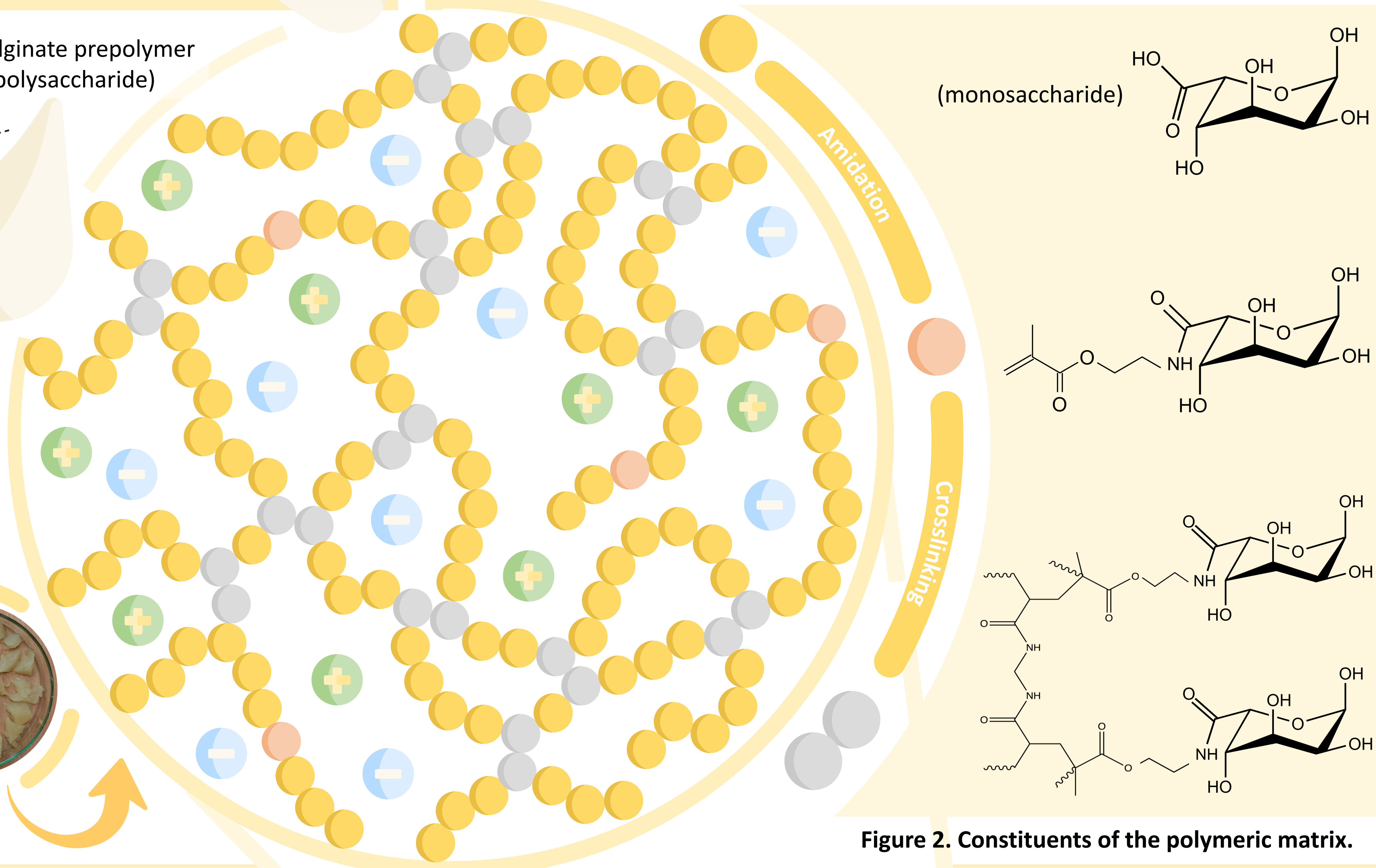


Figure 2. Constituents of the polymeric matrix.

RESULTS AND DISCUSSION

Biofunctional Properties

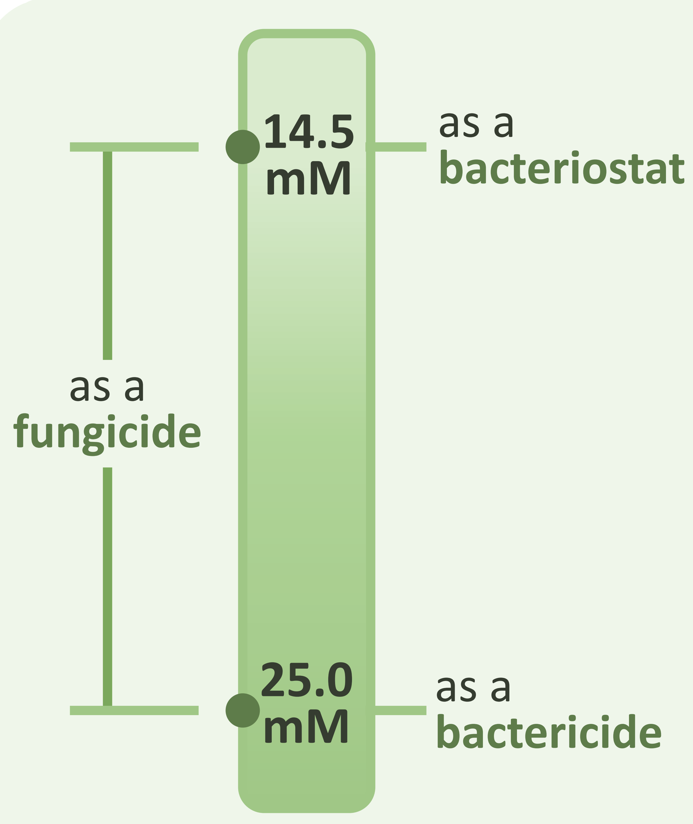
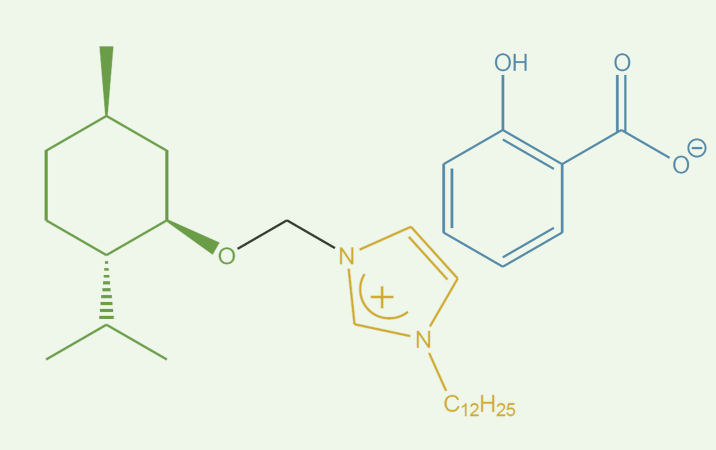


Figure 3. Biostatic and biocidal properties of the representative ionic liquid based on a 6-day incubation set-up*.

*Species: *Pseudomonas cepacia*



3-dodecyl-1-[(1R,2S,5R)-(−)-menthoxymethyl]imidazolium salicylate

Water Uptake

Table 2. Data from 24-hour swelling test.

Sample	Mass before (g)	Mass after (g)	Water Capacity (g/g)
P1	1.43485	10.25772	7.14898
P2	1.64035	11.49426	7.00720
P3	1.75379	9.90134	5.64568

Ionic Liquid Transport

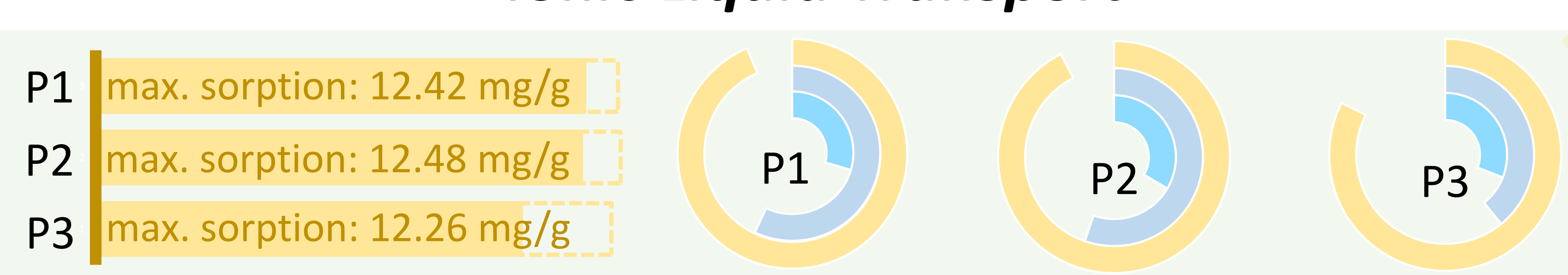


Figure 4. 24-hour sorption-desorption of representative ionic liquid.

CONCLUSION

A **quicker release** was always observed in a system that more closely resembled the moderately acidic nature of fertile soil (pH range: 5 to 6). Such behavior is **ideal for agrochemistry** as release due to degradation can be neglected and the reusability of the polymer is not undermined.

Among the three ionogels, the P2 formulation seems to give the most promising behavior for this ongoing research's purpose. With the possibility of utilizing additive manufacturing techniques such as 3D printing, green biotechnological ionogels that build **functionality at every scale** can be created.

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