Screen the best ionic liquids for keratin dissolution by using COSMO-RS

Liu, Xue; Nie, Yi; Zhang, Suojiang; Skov, Anne Ladegaard

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Screen the best ionic liquid for keratin dissolution by using COSMO-RS

Xue Liu(1)(2), Yi Nie(2), Suojiang Zhang(2)*, Anne Ladegaard Skov(1)*

(1) Danish Polymer Centre, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark;
(2) CAS Key Laboratory of Green Process and Engineering, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, China;
Most PDMS used in tissue engineering applications are nonpolar, inert and highly hydrophobic, which lead to the low biocompatibility and interaction responses between implantations and cells.

Structure of keratin and application of keratin in elastomer

**Structure of keratin**

- Keratin molecules have many inter- and intra-molecular strong bonds and also have no regular repeating units, which lead to it difficult to be dissolved by traditional solvent.
- Keratin has the special amino acid sequence for cell adhesion, which can increase susceptibility to bio-decomposition.
- Keratin can improve the mechanical properties of composites.

**Application of keratin in elastomer**

Keratin dissolution in ionic liquids

Ionic liquid (IL) is a salt in which the ions are poorly coordinated, which results in these solvents being liquid below 100°C, or even at room temperature.

**Properties of ILs**
- High chemical stability and thermal stability
- Wider liquid state, Non-volatile
- Low vapor pressure
- Tunable structure and properties
- Wide electrochemical windows
- High electrical conductivity

**Advantages of ILs in dissolving keratin**
- Higher solubility
- It can be recycled with high recovery rate
- Less damage to keratin structure
- Tunable structure and properties

It is nevertheless a challenge to identify the best ILs for keratin dissolution;
- Experimental measurement of all these systems is not practically feasible;
- A rapid and a priori screening method to predict the keratin solubility capacity for ILs is needed.

### Study of keratin dissolution in ionic liquids

<table>
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<tr>
<th>Author</th>
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<th>Temperature °C</th>
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</table>
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1. Department of Chemical and Biotechnological Engineering, Technical University of Denmark, Kongens Lyngby, Denmark.
2. CEME Laboratory of Process Engineering, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, China.

Abstract

Ionic liquids (ILs) which are often referred to as the “artificial cells” possess many unique advantages, such as lower viscosities, high ionic mobility, and fast response. A molecule-driven (MD) approach is one of the most widely used methods for ILs. To further enhance their performance, a new approach is being applied, which leads to the biocompatibility and interaction response between ILs and keratin. In this study, we explored the potential of ILs for keratin dissolution. The keratin samples were selected from different sources and were treated with different ILs. The dissolution rate of keratin was determined by measuring the weight loss of the samples over time. The results showed that the ILs with a higher dissociation constant (K_diss) had a higher dissolution rate. The IL 152 was found to be the most effective in dissolving keratin, and the maximum dissolution rate was achieved at a temperature of 120°C. The dissolution process was also found to be dependent on the IL concentration, with a higher concentration leading to a higher dissolution rate.

1. Application of keratin in elastomer materials

2. Structures of ILs and keratin models in this study

3. Predictions of ILs and keratin models in this study

4. Conclusions and Advances

References

Acknowledgments

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