Antibacterial activities of N-alkyl imidazolium-based poly(ionic liquid) nanoparticles

Cao Fang, Lingli Kong, Qing Ge, Wei Zhang*, Xianjing Zhou, Li Zhang, and Xinpeng Wang

Department of Chemistry, School of Science, Zhejiang Sci-Tech University Hangzhou 310018, China.

Corresponding author: Wei Zhang (E-mail: zhwei@zstu.edu.cn; zwzist@163.com)
**Fig. S1.** General synthetic route of poly[C\(_n\)VIm\([+]Br\)] (n =8, 10, 12 and 16)

\[ R = C_{8}H_{17}, \, C_{10}H_{21}, \, C_{12}H_{25}, \, C_{16}H_{33} \]

Table S1 Yields and molecular weights of poly[C\(_n\)VIm\([+]Br\)] (n =8, 10, 12 and 16)

<table>
<thead>
<tr>
<th>Samples</th>
<th>Yield</th>
<th>Molecular weight</th>
<th>Mn</th>
<th>PDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>poly[C(_8)VIm([+]Br)]</td>
<td>78%</td>
<td>16855</td>
<td>1.52</td>
<td></td>
</tr>
<tr>
<td>poly[C(_10)VIm([+]Br)]</td>
<td>81%</td>
<td>16231</td>
<td>1.73</td>
<td></td>
</tr>
<tr>
<td>poly[C(_12)VIm([+]Br)]</td>
<td>80%</td>
<td>12379</td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>poly[C(_16)VIm([+]Br)]</td>
<td>76%</td>
<td>10841</td>
<td>1.58</td>
<td></td>
</tr>
</tbody>
</table>
Fig. S2. Number of colony forming units (CFU) of *E. coli* and *S. aureus* treated with PIL nanoparticles at different contacting hours. (A₁-D₁) poly[C₈VIm⁺][Br⁻]; (A₂-D₂) poly[C₁₀VIm⁺][Br⁻]; (A₃-D₃) poly[C₁₂VIm⁺][Br⁻]; (A₄-D₄) poly[C₁₆VIm⁺][Br⁻].
Fig. S3. Differential scanning calorimetry (DSC) curves of poly[C\textsubscript{n}VIm\textsuperscript{+}][Br\textsuperscript{-}] (n = 8, 10, 12 and 16).

Fig. S4. Surface ζ-potential of poly[C\textsubscript{12}VIm\textsuperscript{+}][Br\textsuperscript{-}]-r-PSSNa with different SSNa content prepared by using AIBN and VA86 as initiator.
Fig. S5. Bacterial viabilities of (A) \textit{S. aureus} and (B) \textit{E. coli} after contacting with poly\([\text{C}_{12}\text{VIm}^+]\text{[Br}^{-}\text{]}\)-r-PSSNa for 1 h; The random copolymers were synthesized by using AIBN (green column) and VA86 (red line) as initiator respectively.

Fig. S6. FT-IR spectra of PIL-Trp.
Fig. S7. Energy dispersive X-ray (EDX) spectra of (A) poly[C₈VIm⁺][Br⁻], (B) poly[C₁₂VIm⁺][Br⁻], (C) poly[C₁₆VIm⁺][Br⁻], (D) poly[C₈VIm⁺][Trp⁻], (E) poly[C₁₂VIm⁺][Trp⁻] and (F) poly[C₁₆VIm⁺][Trp⁻].

Fig. S8. Number of colony forming units (CFU) of *E. coli* and *S. aureus* after treated with poly[C₈VIm⁺][Trp⁻] for 1-3 h.
Fig. S9. Number of colony forming units (CFU) of *E. coli* and *S. aureus* after treated with poly[C₁₂VIm⁺][Trp⁻] for 0.5-2 h.

Fig. S10. Number of colony forming units (CFU) of *E. coli* and *S. aureus* after treated with poly[C₁₆VIm⁺][Trp⁻] for 1-3 h.
Fig. S11. (A) FT-IR spectra of poly[C_{12}VIm][Flu^-]; (B) Energy dispersive X-ray (EDX) spectra of the poly[C_{12}VIm][Br] and poly[C_{12}VIm'][Flu^-].