APPENDIX A

FT-IR, $^1$H-NMR and $^{13}$C-NMR of all synthesized gemini surfactants

Figure A-4.1: FT-IR spectrum of BSGSLA$_{1,4}$

Figure A-4.2: FT-IR spectrum of BSGSLA$_{1,6}$
Figure A-4.3: FT-IR spectrum of BSGSLA\textsubscript{1,8}

Figure A-4.4: $^1$H-NMR spectrum of BSGSLA\textsubscript{1,4}
Figure A-4.5: $^1$H-NMR spectrum of BSGSLA$_{1,6}$

Figure A-4.6: $^1$H-NMR spectrum of BSGSLA$_{1,8}$
Appendix A

Figure A-4.7: $^{13}$C-NMR spectrum of BSGSLA$_{1,4}$

Figure A-4.8: $^{13}$C-NMR spectrum of BSGSLA$_{1,6}$
Figure A-4.9: $^{13}$C-NMR spectrum of BSGSLA$_{1,8}$

Figure A-4.10: FT-IR spectrum of BSGSMA$_{1,4}$
Figure A-4.11: FT-IR spectrum of BSGMA$_{1,6}$

Figure A-4.12: FT-IR spectrum of BSGMA$_{1,8}$
Appendix A

Figure A-4.13: $^1$H-NMR spectrum of BSGSMA$_{1,4}$

Figure A-4.14: $^1$H-NMR spectrum of BSGSMA$_{1,6}$
Appendix A

Figure A-4.15: $^1$H-NMR spectrum of BSGSMA$_{1,8}$

Figure A-4.16: $^{13}$C-NMR spectrum of BSGSMA$_{1,4}$
Appendix A

Figure A-4.17: $^{13}$C-NMR spectrum of BSGSMA$_{1,6}$

Figure A-4.18: $^{13}$C-NMR spectrum of BSGSMA$_{1,8}$
Appendix A

Figure A-4.19: FT-IR spectrum of BSGCA$_{1,4}$

Figure A-4.20: FT-IR spectrum of BSGCA$_{1,6}$
Appendix A

Figure A-4.21: FT-IR spectrum of BSGCA$_{1,8}$

Figure A-4.22: $^1$H-NMR spectrum of BSGCA$_{1,4}$
Figure A-4.23: $^1$H-NMR spectrum of BSGCA$_{1,6}$

Figure A-4.24: $^1$H-NMR spectrum of BSGCA$_{1,8}$
Figure A-4.25: $^{13}$C-NMR spectrum of BSGCA$_{1,4}$

Figure A-4.26: $^{13}$C-NMR spectrum of BSGCA$_{1,6}$
Figure A-4.27: $^{13}$C-NMR spectrum of BSGCA$_{1,8}$
APPENDIX B
Plots of fluorescence intensity with quencher concentration for prepared geminis

**Figure B-5.1:** $\ln \left( \frac{I_0}{I_q} \right)$ versus quencher concentration for BSGSLA$_{1,4}$ at 3*CMC, 5*CMC and 9*CMC at 25°C

**Figure B-5.2:** $\ln \left( \frac{I_0}{I_q} \right)$ versus quencher concentration for BSGSLA$_{1,6}$ at 3*CMC, 5*CMC and 9*CMC at 25°C
Appendix B

Figure B-5.3: \( \ln \left( \frac{I_0}{I_q} \right) \) versus quencher concentration for BSGSLA\textsubscript{1,8} at 3*CMC, 5*CMC and 9*CMC at 25\(^\circ\)C

Figure A-5.4: \( \ln \left( \frac{I_0}{I_q} \right) \) versus quencher concentration for BSGSMA\textsubscript{1,4} at 3*CMC, 5*CMC and 9*CMC at 25\(^\circ\)C
**Figure B-5.5:** $\ln \left( \frac{I_0}{I_q} \right)$ versus quencher concentration for BSGSMA$_{1,6}$ at 3×CMC, 5×CMC and 9×CMC at 25°C

**Figure B-5.6:** $\ln \left( \frac{I_0}{I_q} \right)$ versus quencher concentration for BSGSMA$_{1,8}$ at 3×CMC, 5×CMC and 9×CMC at 25°C
**Figure B-5.7:** $\ln \left( \frac{I_0}{I_q} \right)$ versus quencher concentration for BSGSCA$_{1,4}$ at 3*CMC, 5*CMC and 9*CMC at $25^\circ$C

**Figure B-5.8:** $\ln \left( \frac{I_0}{I_q} \right)$ versus quencher concentration for BSGSCA$_{1,6}$ at 3*CMC, 5*CMC and 9*CMC at $25^\circ$C
Figure B-5.9: \( \ln \left( \frac{I_0}{I_q} \right) \) versus quencher concentration for BSGSCA_{1,8} at 3*CMC, 5*CMC and 9*CMC at 25^\circ C
APPENDIX C

Surface tension versus surfactant concentration profiles of prepared gemini surfactants

Figure C- 6.1: Surface tension versus surfactant concentration profile of BSGSLA$_{1,4}$in $10^{-3}$ M inorganic and organic salts

Figure C- 6.2: Surface tension versus surfactant concentration profile of BSGSLA$_{1,4}$ in $10^{-2}$ M inorganic and organic salts.
Figure C- 6.3: Surface tension versus surfactant concentration profile of BSGSLA$_{1,4}$ in $5 \times 10^{-2}$ M inorganic and organic salts

Figure C- 6.4: Surface tension versus surfactant concentration profile of BSGSLA$_{1,4}$ in $10^{-1}$ M inorganic and organic salts
Figure C-6.5: Surface tension versus surfactant concentration profile of BSGSLA_{1,6} in 10^{-3} M inorganic and organic salts

Figure C-6.6: Surface tension versus surfactant concentration profile of BSGSLA_{1,6} in 10^{-2} M inorganic and organic salts
Figure C- 6.7: Surface tension versus surfactant concentration profile of BSGSLA$_{1,6}$ in 5 X $10^{-2}$ M inorganic and organic salts

Figure C- 6.8: Surface tension versus surfactant concentration profile of BSGSLA$_{1,6}$ in $10^{-1}$ M inorganic and organic salts
Figure C- 6.9: Surface tension versus surfactant concentration profile of BSGSLA$_{1,8}$ in $10^{-3}$ M inorganic and organic salts

Figure C- 6.10: Surface tension versus surfactant concentration profile of BSGSLA$_{1,8}$ in $10^{-2}$ M inorganic and organic salts
Figure C- 6.11: Surface tension versus surfactant concentration profile of BSGSLA_{1,8} in $5 \times 10^{-2}$ M inorganic and organic salts

Figure C- 6.12: Surface tension versus surfactant concentration profile of BSGSLA_{1,8} in $10^{-1}$ M inorganic and organic salts
Figure C-6.13: Surface tension versus surfactant concentration profile of BSGSMA$_{1,4}$ in $10^{-3}$ M inorganic and organic salts

Figure C-6.14: Surface tension versus surfactant concentration profile of BSGSMA$_{1,4}$ in $10^{-2}$ M inorganic and organic salts
Figure C-6.15: Surface tension versus surfactant concentration profile of BSGSMA$_{1,4}$ in $5 \times 10^{-2}$ M inorganic and organic salts

Figure C-6.16: Surface tension versus surfactant concentration profile of BSGSMA$_{1,4}$ in $10^{-1}$ M inorganic and organic salts
Appendix C

Figure C-6.17: Surface tension versus surfactant concentration profile of BSGSMA<sub>1,6</sub> in 10<sup>-3</sup> M inorganic and organic salts

Figure A-6.18: Surface tension versus surfactant concentration profile of BSGSMA<sub>1,6</sub> in 10<sup>-2</sup> M inorganic and organic salts
Figure A-6.19: Surface tension versus surfactant concentration profile of BSGSMA\textsubscript{1,6} in 5 \( \times 10^{-2} \) M inorganic and organic salts.

Figure D-6.20: Surface tension versus surfactant concentration profile of BSGSMA\textsubscript{1,6} in \( 10^{-1} \) M inorganic and organic salts.
Figure C-6.21: Surface tension versus surfactant concentration profile of BGSMA$_{1,8}$ in $10^{-3}$ M inorganic and organic salts

Figure C-6.22: Surface tension versus surfactant concentration profile of BGSMA$_{1,8}$ in $10^{-2}$ M inorganic and organic salts
Figure C- 6.23: Surface tension versus surfactant concentration profile of BSGSMA$_{1,8}$ in 5 X $10^{-2}$ M inorganic and organic salts

Figure C- 6.24: Surface tension versus surfactant concentration profile of BSGSMA$_{1,8}$ in $10^{-1}$ M inorganic and organic salts
Figure C-6.25: Surface tension versus surfactant concentration profile of BSGCA$_{1,4}$ in $10^{-3}$ M inorganic and organic salts

Figure C-6.26: Surface tension versus surfactant concentration profile of BSGCA$_{1,4}$ in $10^{-2}$ M inorganic and organic salts
Figure C-6.27: Surface tension versus surfactant concentration profile of BSGSCA$_{1,4}$ in $5 \times 10^{-2}$ M inorganic and organic salts

Figure C-6.28: Surface tension versus surfactant concentration profile of BSGSCA$_{1,4}$ in $10^{-1}$ M inorganic and organic salts
Figure C-6.29: Surface tension versus surfactant concentration profile of BSGSCA$_{1,6}$ in $10^{-3}$ M inorganic and organic salts

Figure C-6.30: Surface tension versus surfactant concentration profile of BSGSCA$_{1,6}$ in $10^{-2}$ M inorganic and organic salts
Figure C-6.31: Surface tension versus surfactant concentration profile of BSGCA_{1,6} in 5 \times 10^{-5} \text{ M} inorganic and organic salts

Figure C-6.32: Surface tension versus surfactant concentration profile of BSGCA_{1,6} in 10^{-1} \text{ M} inorganic and organic salts
Figure C-6.33: Surface tension versus surfactant concentration profile of BSGCA$_{1,8}$ in $10^{-3}$ M inorganic and organic salts

Figure C-6.34: Surface tension versus surfactant concentration profile of BSGCA$_{1,8}$ in $10^{-2}$ M inorganic and organic salts
**Figure C-6.35:** Surface tension versus surfactant concentration profile of BSGCA\textsubscript{1,8} in 5 X 10^{-2} M inorganic and organic salts

**Figure C-6.36:** Surface tension versus surfactant concentration profile of BSGCA\textsubscript{1,8} in 10^{-1} M inorganic and organic salts
APPENDIX D

Plots of fluorescence intensity with quencher concentration for binary mixed study

Figure D-7.1: Plot of ln (I₀/Iₚ) vs quencher concentration for pure BSGSLA₁.₈. XX

Figure D-7.2: Plot of ln (I₀/Iₚ) vs quencher concentration for different mixed surfactant systems. XX
Figure D-7.3: Plot of ln (I/o/I_q) vs quencher concentration for different mixed surfactant systems. xx

Figure D-7.4: Plot of ln (I/o/I_q) vs quencher concentration for pure BSGSMA1,8. xx
Appendix D

Figure D-7.5: Plot of $\ln (I_o/I_q)$ vs quencher concentration for different mixed surfactant systems.

Figure D-7.6: Plot of $\ln (I_o/I_q)$ vs quencher concentration for different mixed surfactant systems.
**Figure D-7.7:** Plot of $\ln \left( \frac{I_o}{I_q} \right)$ vs quencher concentration for pure BSGSCA$_{1.8}$.  

**Figure D-7.8:** Plot of $\ln \left( \frac{I_o}{I_q} \right)$ vs quencher concentration for different mixed surfactant systems.
Figure A-7.9: Plot of $\ln \left( \frac{I_o}{I_q} \right)$ vs quencher concentration for different mixed surfactant systems. \textsuperscript{xx}

\textsuperscript{xx} Concentration (0.01 mol/L) fixed for BSGSLA\textsubscript{1,8}, BSGSMA\textsubscript{1,8} and BSGSCA\textsubscript{1,8} in mixed surfactant system