

Supplementary Material

Synthesis of Novel Ethoxylated Quaternary Ammonium Gemini Surfactants for Enhanced Oil Recovery Application

S. M. Shakil Hussain ¹, Muhammad Shahzad Kamal ^{1,*} and Mobeen Murtaza ²

¹ Center for Integrative Petroleum Research, King Fahd University of Petroleum & Minerals, Dhahran 31261, Saudi Arabia; smshakil@kfupm.edu.sa

² College of Petroleum Engineering, King Fahd University of Petroleum & Minerals, Dhahran 31261, Saudi Arabia; Mobeen@kfupm.edu.sa

* Correspondence: shahzadmalik@kfupm.edu.sa; Tel.: +966-13-860-8513

Received: 31 March 2019; Accepted: 30 April 2019; Published: date

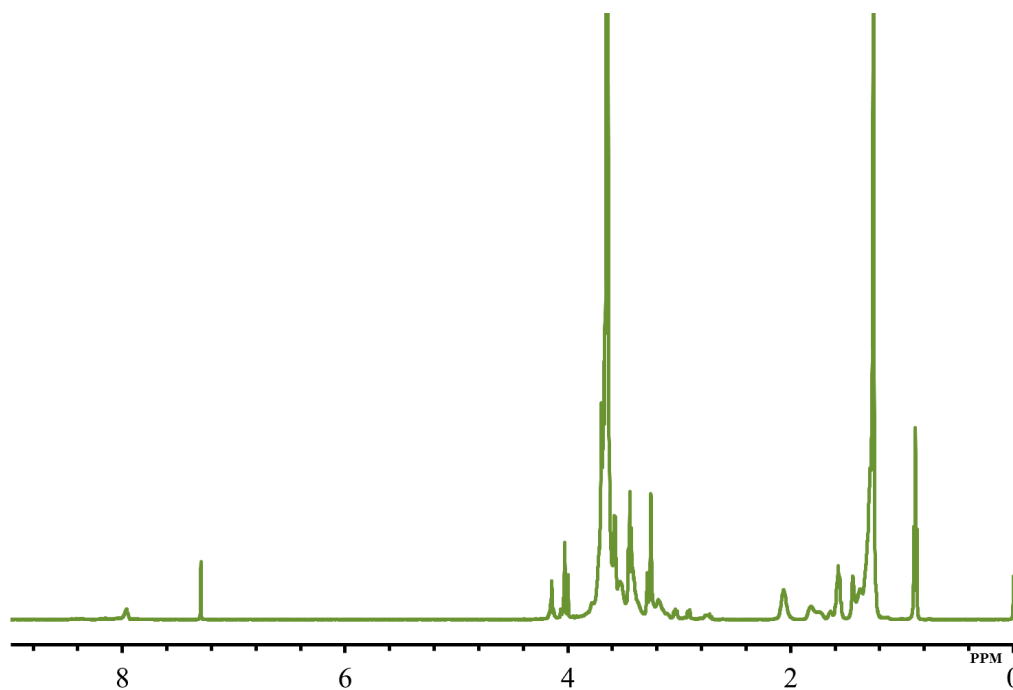


Figure S1. ¹H NMR of quaternary ammonium gemini surfactants (GS8).

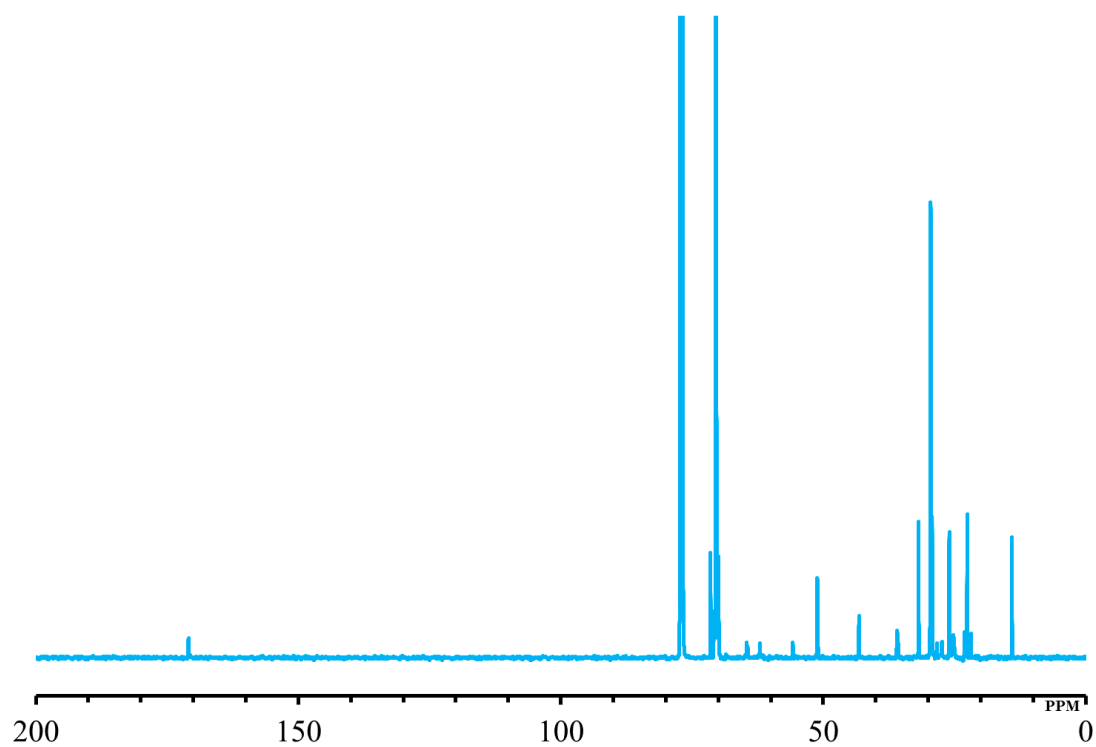


Figure S2. ^{13}C NMR of quaternary ammonium gemini surfactants (GS8).

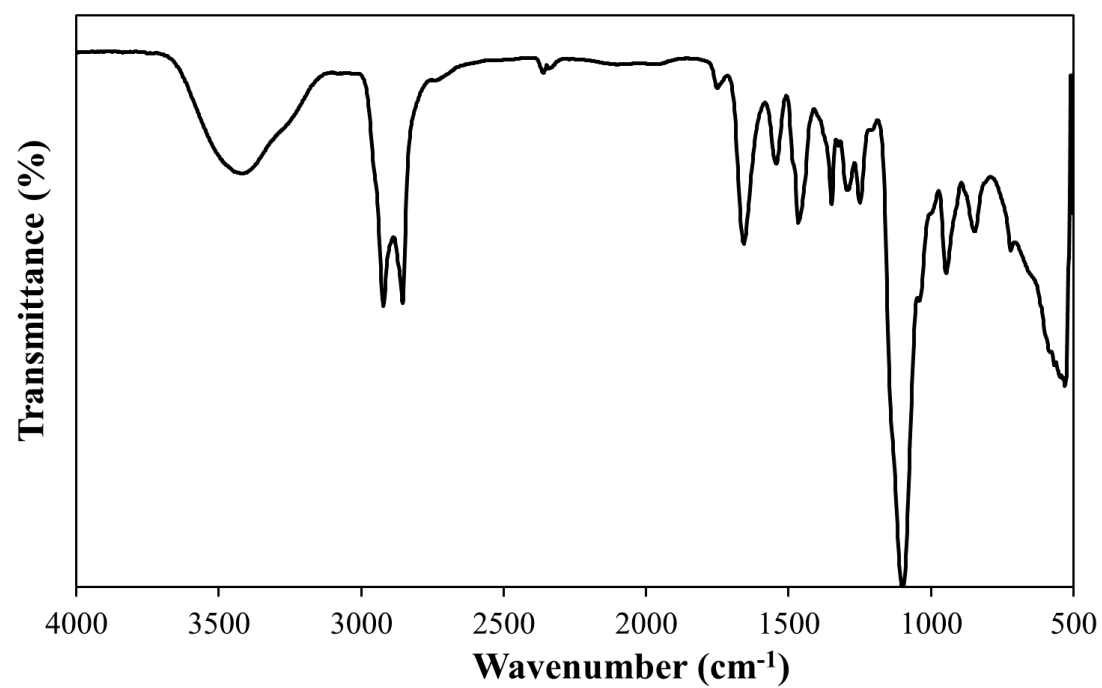


Figure S3. FT-IR spectra of quaternary ammonium gemini surfactants (GS8).

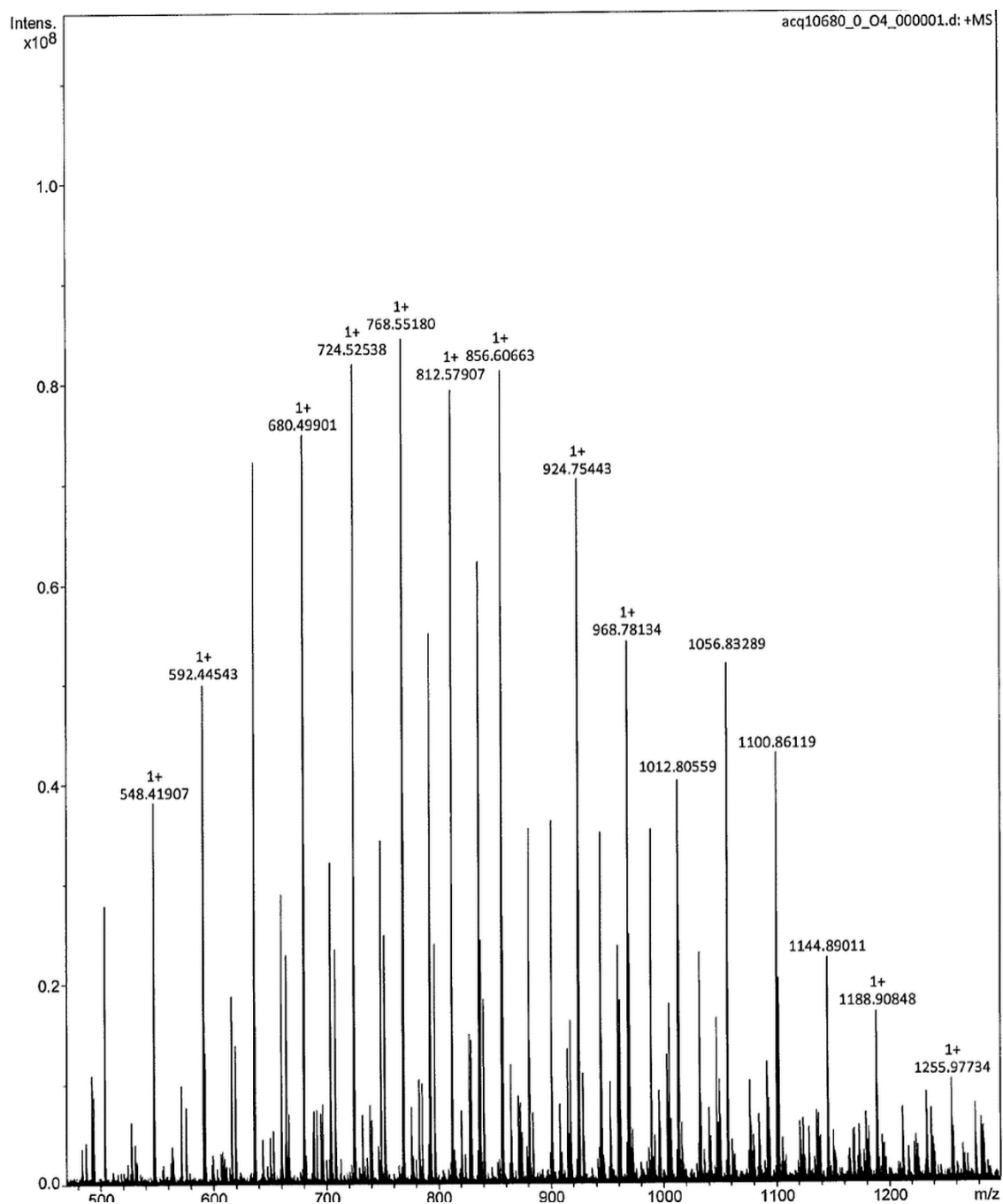


Figure S4. MALDI-TOF MS analysis of quaternary ammonium gemini surfactants (GS8).

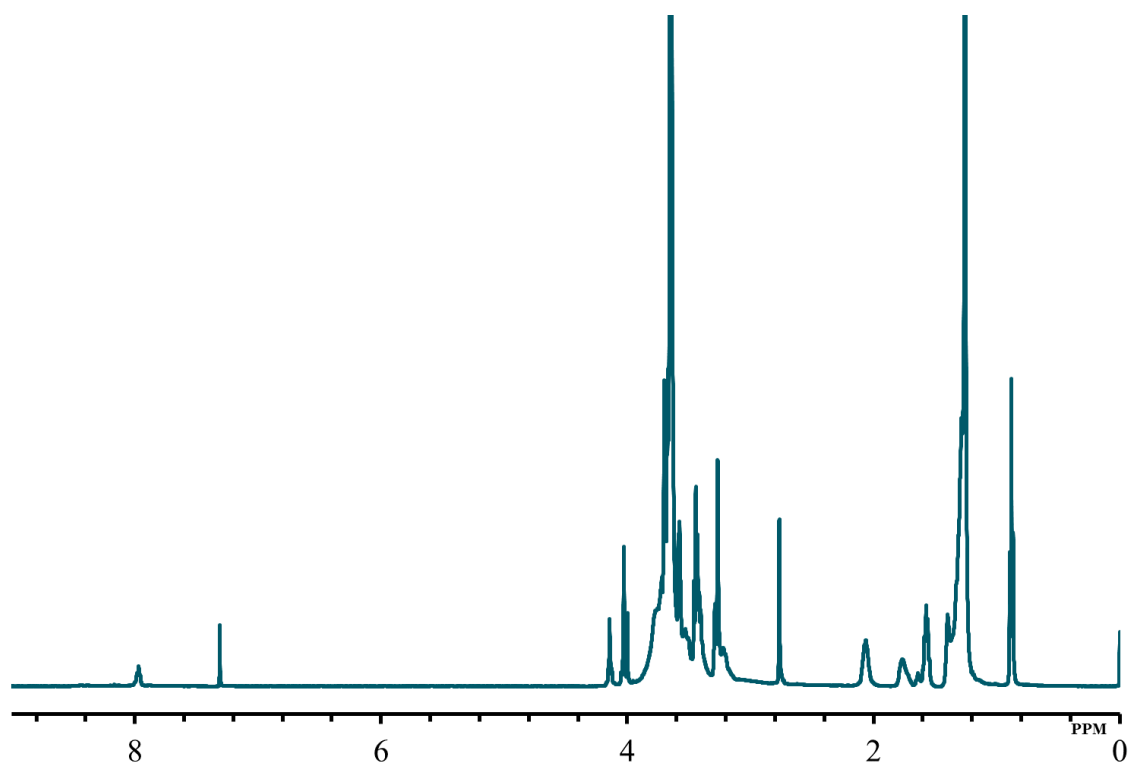


Figure S5. ¹H NMR of quaternary ammonium gemini surfactants (GS10).

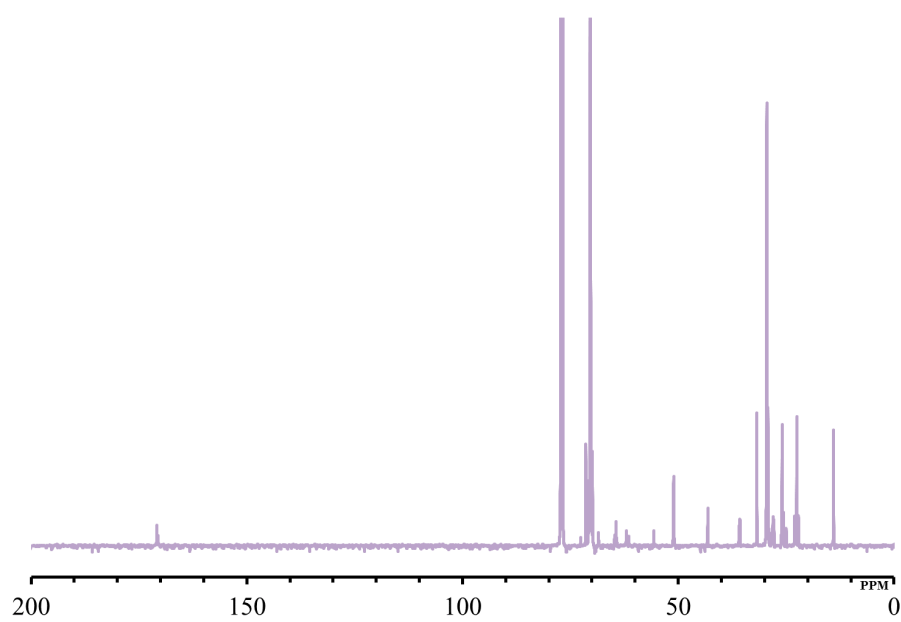


Figure S6. ¹³C NMR of quaternary ammonium gemini surfactants (GS10).

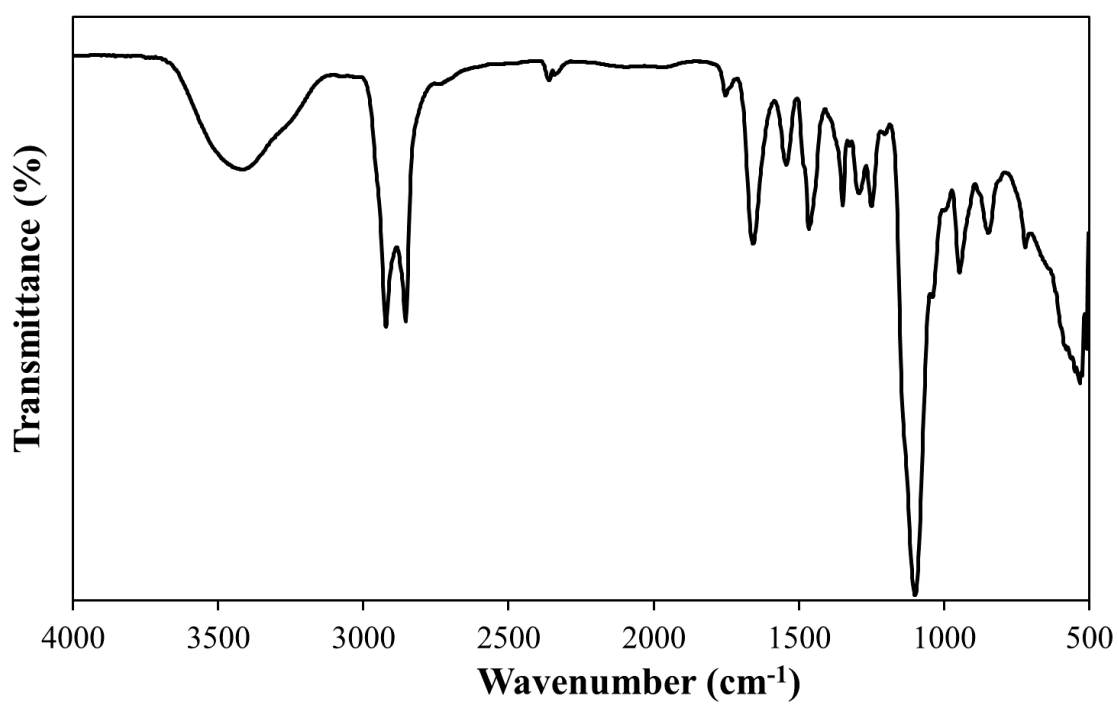


Figure S7. FT-IR spectra of quaternary ammonium gemini surfactants (GS10).

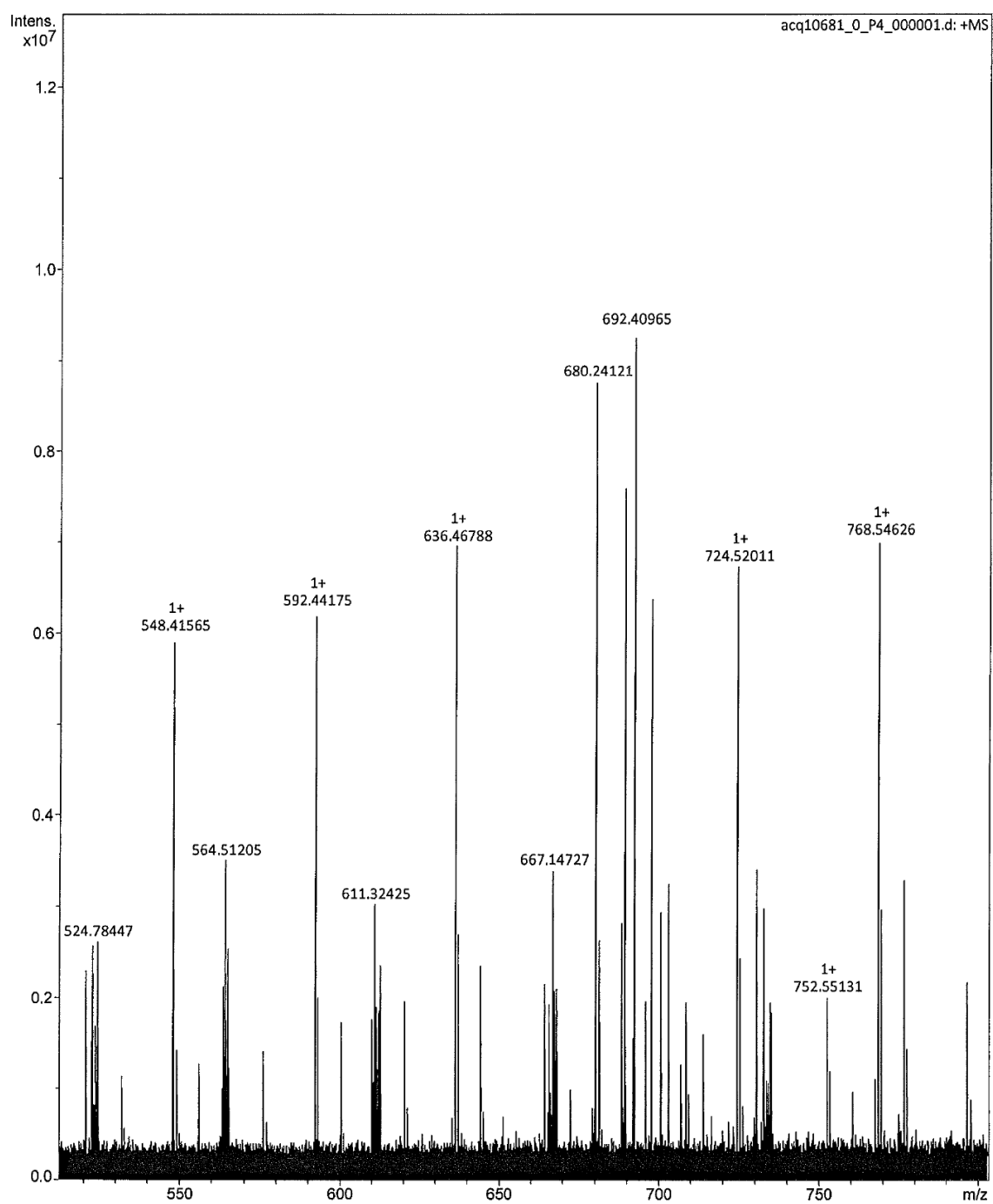


Figure S8. MALDI-TOF MS analysis of quaternary ammonium gemini surfactants (GS10).