



SIMS-24

24th International Conference on Secondary Ion Mass Spectrometry

8-13 September 2024

La Rochelle, France

www.sims-24.com

ToF-SIMS applications for the development of household and personal care products

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ToF-SIMS is one of the most powerful analytical techniques for organic materials, providing both molecular detection and imaging at submicron levels. In our laboratory, ToF-SIMS has been applied in various fields including materials such as polymers, fibers, surfactants, and biological samples such as human hair [1] and skin [2]. Additionally, the introduction of Ar gas cluster ion beam (GCIB) and cryogenic-systems has expanded the application fields of ToF-SIMS. This presentation will explain the applied research using these methods.

ToF-SIMS is useful for analyzing surface chemical structure, and depth profiling of organic materials with high depth resolution can be achieved by using GCIB as a sputtering source. In our previous studies, GCIB-ToF-SIMS depth profiling technique has been applied to the structural analyses of hair cuticles [3] or thin films adsorbed on the substrates. In this study, analysis of biofilms using GCIB-ToF-SIMS was carried out and investigated the mechanism of biofilm removal caused by a washing agent [4].

For the analysis of liquid products or the products containing volatile ingredients, cryogenic systems is considered a powerful tool. As an example, the applications of the Cryo-ToF-SIMS/SEM system [5], which combines Cryo-ToF-SIMS and Cryo-SEM, for morphology and components analyses of fabric softener solutions, as well as investigation of their properties, will be described.

1. M. Okamoto et al., *Surface and Interface Analysis*, 43, 298-301, (2011).
2. M. Okamoto et al., *Applied Surface Analysis*, 252, 6805-6808 (2006).
3. K. Ishikawa et al., *Biointerphases*, 11(2), 02A315-1-5 (2016).
4. T. Hara et al., *Scientific Reports*, 11, Article number: 12524 (2021).
5. K. Kuroda et al., *Surface Interface Analysis*, 45, 215-219 (2013).