

## Investigation into the Distribution of Oligomer within Glass Fibre Reinforced Plastic using SIMS

Yasuko Kajiwara<sup>1\*</sup>, Miyuki Takeuchi<sup>2</sup>, Satoka Aoyagi<sup>3</sup>, Hiromitsu Nagashima<sup>4</sup> and Satoshi Nagai<sup>5</sup>

<sup>1</sup>MGC Chemical Analysis Center, Mitsubishi Gas Chemical Company, INC., Tokyo 125-8601, Japan <sup>2</sup> Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo 113-8657, Japan

<sup>3</sup>Graduate School of Science and Technology, Seikei University, Tokyo 180-8633, Japan <sup>4</sup>Engineering Plastics Division, Mitsubishi Gas Chemical Company, INC., Tokyo 100-8324, Japan <sup>5</sup>Technical Centre, Mitsubishi Engineering-Plastics Corporation, Kanagawa 254-0016, Japan

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Glass fibre reinforced plastic (GFRP) is one of the most popular high functional materials owing to its high strength and toughness along with its lightweight. For example, glass fibre reinforced polycarbonate (PC) is generally used for machine parts of vehicles and frames of digital appliances due to the above qualities. In the case of glass fibre reinforced PC, PC oligomer is deliberately added into PC polymer in order to prevent glass fibre from being exposed on the surface [1]. On the other hand, the interphase of glass fibre and polymer matrix whose thickness is estimated to be a few hundreds nanometres [2] significantly affects mechanical behaviour of GFRP. However, chemical properties in the interphase have not been directly investigated because of the limitation of analysis methods for acquiring chemical information on such a small scale.

Secondary ion mass spectrometry (SIMS) is a powerful technique for studying surface and interface chemistry because it can provide chemical information with a high spatial resolution down to around 50 nanometres. Time-of-flight SIMS (ToF-SIMS) equipped with a pulsed primary ion beam and a time-of-flight mass spectrometer is commonly used in the surface analysis of organic materials because parts of molecular structures are retained during the sputtering process. In contrast, NanoSIMS equipped with a DC primary ion beam and a magnetic sector spectrometer is a well established tool for localized isotope ratio and trace element analysis in microbiology and cosmochemistry.

In this presentation, two approaches for clarifying the distribution of PC oligomer within glass fibre reinforced plastics using SIMS will be shown. One of which is a combination of ToF-SIMS and principal component analysis (PCA), one of the multivariate analysis methods [3] and the other is an isotopic ratio imaging of deuterium-labelled PC oligomer by NanoSIMS.

**Keywords**: Glass fiber reinforced plastic (GFRP); Polycarbonate (PC); Secondary ion mass spectrometry (SIMS); Principal component analysis (PCA)

## References

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