

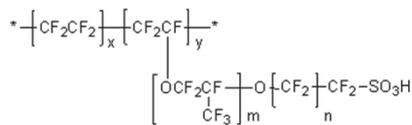
# AFM Observation of Nafion® Dispersions in Fluid and Evaluation of Size Distribution by GPC-MALS

It is of much importance to observe morphology and evaluate size distribution of fluorinated dispersion because they are intimately interrelated to electrode structure. AFM observation in fluid and GPC-MALS enable us to characterize particles of NafionR dispersion and its size distribution.

## Samples

Following 2 dispersions consisted of fluorinated electrolyte were prepared.  
 Sample A : Fluorinated electrolyte (Nafion®) dispersion  
 Sample B : Dispersion prepared from fluorinated electrolyte membrane (Its side-chain structure is different from that of Sample A)

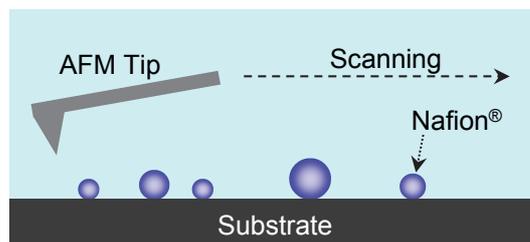
Structural formula of fluorinated electrolyte (Nafion®)



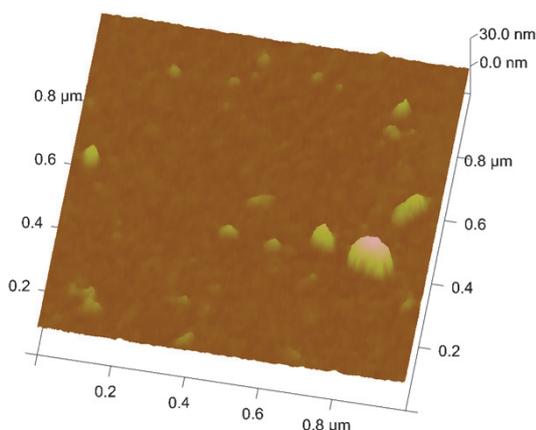
## AFM observation of Nafion® particles in fluid

✓ A positively-charged substrate, using silicone wafer in this work, enables us to scan Nafion® particles softly in fluid because they are stably adsorbed on the substrate by electrostatic force.

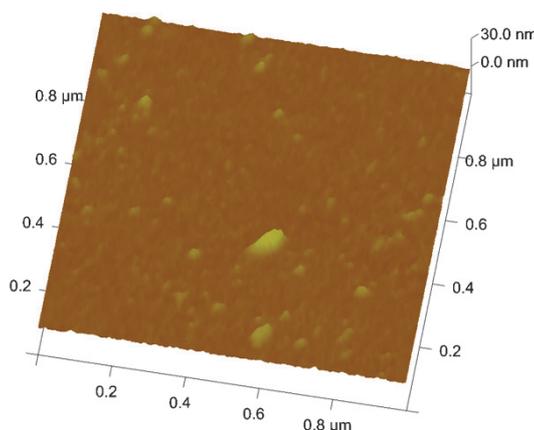
✓ AFM images revealed that an average particle size of sample A was 50-100 nm and that of sample B was 10-50 nm. Some particles with large size in AFM images were assumed to be aggregated one.



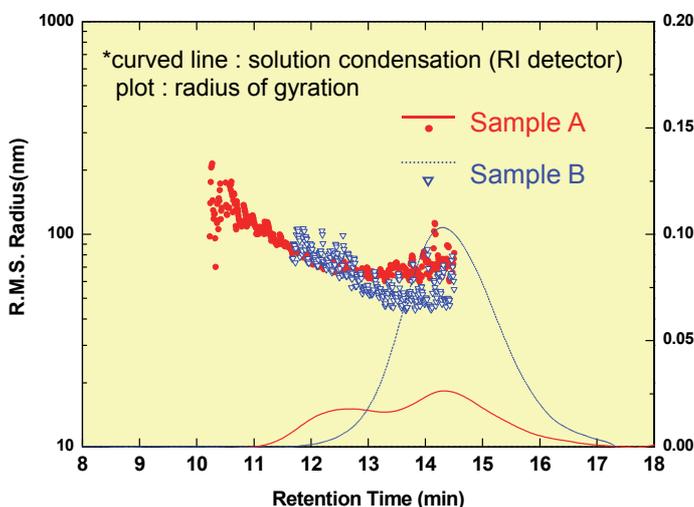
Sample A



Sample B



## Evaluation of size distribution by GPC-MALS



✓ GPC-MALS, which is usually applicable for evaluations of molecular weight and radius of gyration of polymer solution, also enables us to evaluate size distribution of dispersion in this work.

✓ The result of GPC-MALS indicated that sample A showed two peaks, on the other hand, sample B showed only one peak.

✓ An average molecular weight radius of gyration was 78 nm for sample A and 65 nm for sample B, which is in good agreement with AFM images.

## Summary

AFM observation in fluid and GPC-MALS enable us to distinguish the difference of particle size among some fluorinated electrolyte dispersions.