§11. Evaluation of Microwave Absorption for Solid and Liquid Samples by Coaxial Cable Probe Method

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In some processes of ceramic forming such as slip casting, wet pressing etc. solid-water system materials are utilized. When preparing ceramic slurry or wet plastic body, dispersant, binder etc. are added to the solid-water system materials in order to give fluidity for forming process and shape retaining nature for obtained formed bodies.

In this study, we measured microwave absorption behavior of polyacrylic acid based dispersant to consider the influence of dispersant addition to slurry on the microwave heating.

The measuring system is consist of a microwave network analyzer (Agilent technologies: 8573E) and a coaxial cable probe (hand made using a RG402/U coaxial cable with outer diameter of 3.58mm), and the complex dielectric constants (permittivity) are measured at a frequency range from 0.2 to 3GHz by using a dielectric measurement software (Agilent technologies: 85070B). As the sample, a polyacrilic acid based dispersant (A6114: Toagosei Co., LTD.) dissolved aqueous solution is subjected to the permittivity measurement. Moreover, dried dispersant (moisture removed at $120^{\circ}C$) is uni-axially pressed and the obtained compact sample is also subjected to the permittivity measurement.

Fig. 1. shows measurement results of the complex permittivity for water, dispersant added aqueous solutions (dispersant concentrations are 1 and 10 mass%) and dried (moisture removed) dispersant. As seen in the figure, ε' value of 10 mass% dispersant added water (aqueous solution) is about 4 times bigger at 2.45GHz and more than 100times bigger at 0.3GHz than that of pure water though difference of ε" value among them is within 20% on measurement frequency range. This trend is similar to the electrolyte aqueous solutions. Measurement result for 1mass% dispersant added water shows the intermediate values of them. The bottom figure shows the measurement results for dried (moisture removed) polyacrilic acid type dispersant. Both ε' and ε" values are very small. From these results, it can be say that the microwave permittivity of dispersant (polyacrilic acid) becomes very big by coexistence with water, eq. when the dispersant dissolved in water. In the water, terminal groups of polyacrilic acid are dissociated, and permittivity behavior on frequency shows similar trend with the electrolyte aqueous solutions.

As a conclusion, polyacrilic acid type dispersant shows big microwave absorption when it dissolved in water like the electrolyte aqueous solutions.

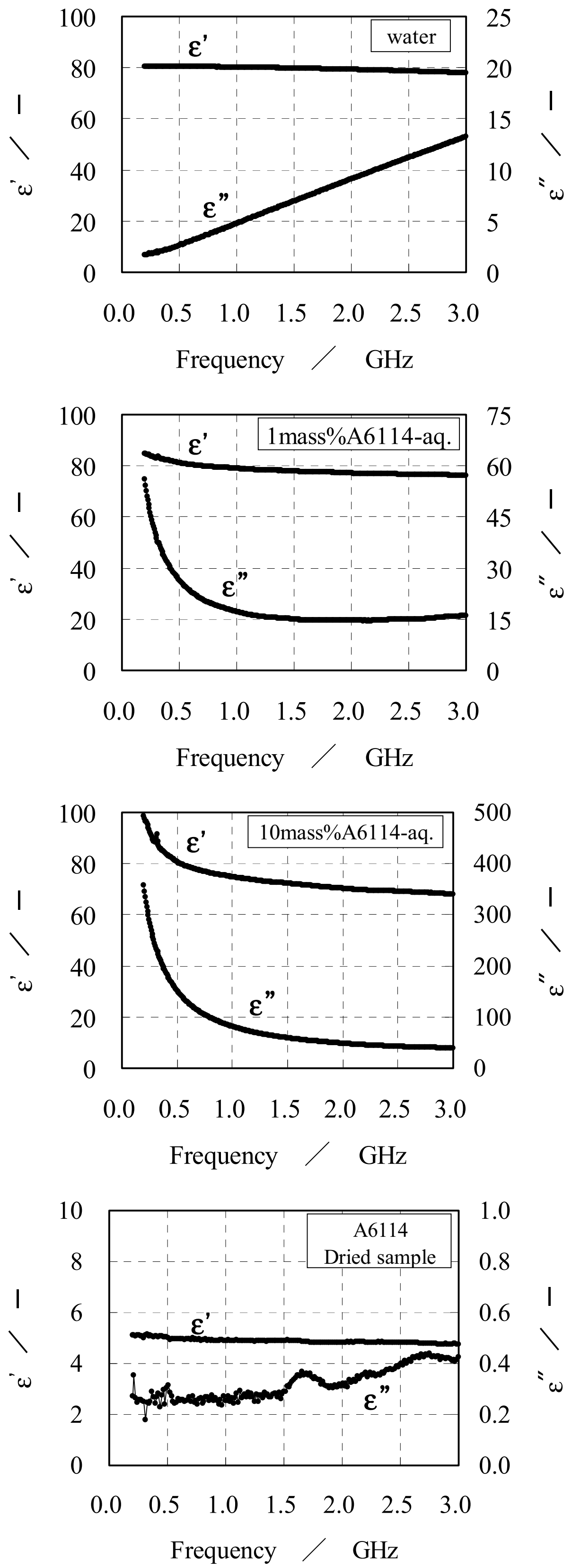

Fig.1. Results of complex permittivity measurements for water, dispersant added water solutions and dried (solid) dispersant.