23.Hydrosilylation Derived Silicon-Containing Hydrocarbon-Based Polymers for Low Loss Dielectric Applications

Yuka Azuma[1], Riku Takahashi[1], Natsuko Sashi[1], Kan Hatakeyama[1], Yuta Nabae[1], Ririka Sawada[2], Shinji Ando[2], Teruaki Hayakawa[1*]

[1]Department of Materials Science and Engineering, School of Materials and Chemical Technology, Institute of Science Tokyo, 2-12-1-S8-36, Ookayama, Meguro-ku Tokyo 152-8552, Japan,[2]Department of Chemical Science and Engineering, School of Materials and Chemical Technology,Institute of Science Tokyo, 2-12-1-E4-5,Ookayama, Meguro-ku Tokyo 152-8552, Japan.

*hayakawa@mct.isct.ac.jp

Abstract: For the next-generation wireless communication systems using millimeter-wave frequencies, polymer materials exhibiting low dielectric constants (D_k) and low loss tangents (D_f) are required to reduce transmission loss. In this study, silicon-containing hydrocarbon-based polymers were synthesized for such high-frequency dielectric applications[1]. They were prepared by Karstedt-catalyzed polyaddition of dihydrosilanes with diyne or diene monomers[2]. Their hydrocarbon backbones and silicon-containing units were designed to reduce molecular polarizability, increase free volume, and suppress moisture adsorption[3]. The dielectric properties were evaluated at 20 and 40 GHz using a cavity resonator, and the polymers exhibited low D_k and low D_f. In particular, the diyne-derived polymers showed lower D_f than the diene-derived polymers, suggesting that backbone rigidity suppresses dipolar relaxation at higher frequencies. These results indicate that silicon-containing hydrocarbon-based polymers are promising low-loss dielectric materials for advanced communication technologies.

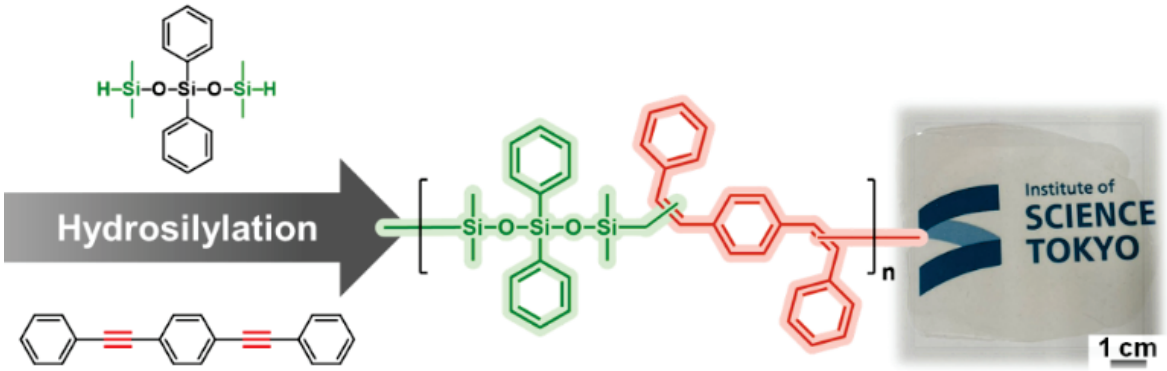

Figure 1 Silicon-containing hydrocarbon-based polymer.

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Key words: Silicon-containing polymer, Hydrosilylation reaction, Low dielectric loss

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