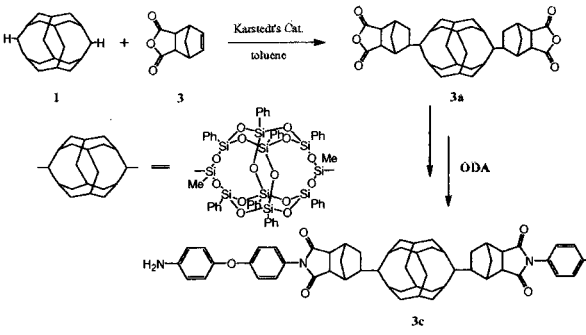
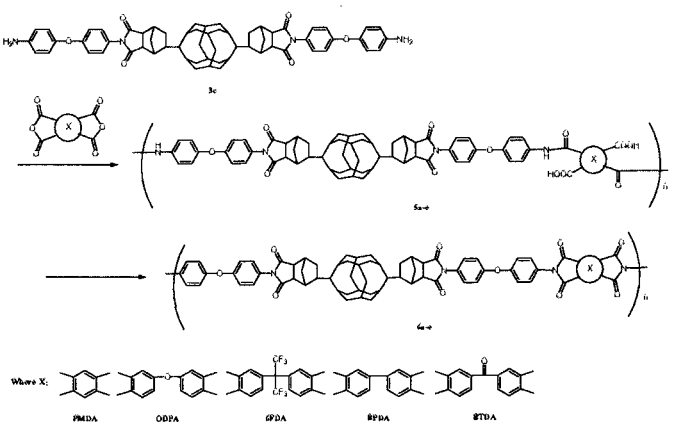
Synthesis and Characterization of Semiaromatic Polyimides Containing POSS in Main Chain Derived from Double-decker-shaped Silsesquioxane

Shouming Wu, Teruaki Hayakawa, Masa-aki Kakimoto, Hisao Oikawa
(Tokyo Tech, Chisso Petrochem. Corp., Japan)

A novel double-decker-shaped silsesquioxane dianhydride (**3a**) was synthesized by hydrosilylation method from DDSQ (**1**) and cis-5-norbornene-end-2,3-dicarboxylic anhydride (**3**), which then reacted with ODA to produce another double-decker-shaped silsesquioxane diamine (DDSQ-diamine) (**3c**). A series of semiaromatic polyimides containing POSS in main chain (POSS-PIs) from the novel DDSQ-diamine with various aromatic tetracarboxylic dianhydrides were prepared and characterized by IR and NMR spectra. The POSS-PIs possess good thermal stability and mechanical properties, low water adsorption, and alkali resistance as well as low dielectric constant. The 5 % weight loss temperatures (T_{d5}) in air were observed at 495-514 °C. The polymer films have good mechanical properties with elongation at breakage of 2.9-6.0 %, in which POSS-PI **6c** derived from ODPA exhibits the highest elongation of 6.0 %. The water adsorption of POSS-PI **6b** (<1 %) is very lower than that PI of PMDA/ODA (6.0 %). POSS-PIs **6** possess excellent alkaline or acid resistance. POSS-PI **6b** keeps its flexible mechanical properties immersing in 5 % NaOH solution at 40 °C for 72 h. The dielectric constant of POSS-PI **6c** measured by precision impedance method was 2.36.





References

[1] Seino,M; Hayakawa, T.; Ishida, Y.; Kakimoto, M.; Watanabe, K.; Oikawa, H. *Macromolecules* **2006**, *39*, 3473.

[2] Watanabe, Y.; Sakai, Y.; Shibasaki, Y.; Ando, S.; Ueda, M.; Oishi, Y.; Mori, K. *Macromolecules* **2002**, *35*, 2277.

Correspondence : e-mail mkakimot@o.cc.titech.ac.jp; TEL +81-3-5734-2429; FAX +81-3-5734-2785