

Preparation of soluble polyamides by condensation of POSSs containing carboxyl and ammonium groups

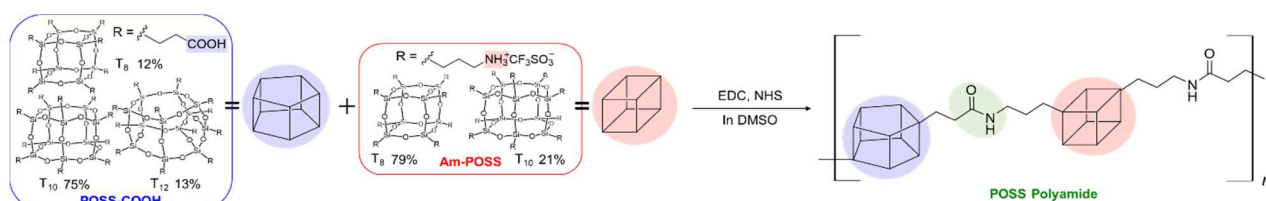
Tomoya Kozuma¹ and Yoshiro Kaneko^{1*}

Abstract

Polyhedral oligomeric silsesquioxane (POSS) has attracted much attention as an inorganic framework compound with thermal and chemical stabilities and solubility. However, since POSS is an oligomer, it is difficult to apply it alone as film or bulk materials. Therefore, the preparation of POSS-linking polymers has been actively performed in recent years. However, as POSS generally has multiple functional groups, a polymer obtained by its polymerization usually forms a network structure and becomes insoluble. In order to prepare soluble POSS-linking polymers, it is necessary to prepare POSSs in which the number and arrangement of different substituents are controlled.^{1,2} However, to prepare such POSSs, complicated reactions and purification processes are required.

Meanwhile, we have reported that POSS-linking polymer can be easily prepared by hydrolytic condensation of a mixture of 3-(2-aminoethylamino)propyltrimethoxysilane and bis[3-(trimethoxysilyl)propyl]amine in a superacid trifluoromethanesulfonic acid aqueous solution.³ However, this POSS-linking polymer could not form a self-standing film, probably because the alkylammonium group linking POSSs has a flexible structure.

In this study, when an ammonium-group-containing POSS (**Am-POSS**) and a carboxyl-group-containing POSS (**POSS-COOH**), which were previously reported by us,^{4,5} were polycondensed using condensing agents, we found that soluble POSS-linking polymer (**POSS Polyamide**) were successfully prepared. Formation of amide bonds was confirmed by FT-IR and ¹H NMR measurements. The ²⁹Si NMR spectrum of POSS Polyamide indicated that the POSS structure was maintained even after polymerization. **POSS Polyamide** was soluble in polar solvents, such as water, DMSO, and methanol. In addition, a self-standing film can be formed by heating and evaporating aqueous solution of **POSS Polyamide**.



Scheme 1. Preparation of **POSS Polyamide**.

References

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¹Graduate School of Science and Engineering, Kagoshima University, 890-0065, Kagoshima, Japan