PT Hydrosilylation catalyst studied by fluorescence XAFS(2)

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Introduction

Silicones are one of important chemicals in daily life. Hydrosilylation is a key reaction in the silicones industry and is often catalyzed by Pt complex. The identification of the active structure for Pt catalyst during reaction conditions is important to understand the catalytic reaction. However, the Pt concentration used in catalytic reaction conditions is in the range of a few to, at most, 100 ppm, which makes it difficult to carry out spectroscopic characterization. In our last report we described the measurement of XAFS signal on the 50 ppm Pt catalyst by a fluorescence mode. In this work, we will report the XAFS results of Pt catalyst before and after the reaction.

Experimental

Pt catalyst was put in a polyethylene terephthalate(PET) bag which was sealed with a polysealer. The sample was then put in the optical path. The XAFS measurements were carried out at BL12C in a transmission mode or fluorescence mode. A Ge SSD was used to detect Pt Lα fluorescence.

Results

Fig. 1 shows the Fourier transform of Pt catalyst dissolved in cyclohexane. The catalyst has a structure shown in Fig.2. Pt-C and Pt-Si bondings were clearly seen in the Fourier transform. After the reaction with cyclohexene and $HSi(CH_3)Cl_2$ in the presence of MBO(3-methyl-1-buthyn-3-ol), the first peak shifted to higher bond length side and became larger. The curve fitting analyses indicated the presence of Pt-Cl bond. On the other hand, when the catalyst was interacted with cyclohexene and $HSi(CH_3)Cl_2$ without MBO, the Pt-Pt interaction was observed. MBO is used to enhance the reactivity and the role of MBO may be to prevent the formation of Pt cluster.

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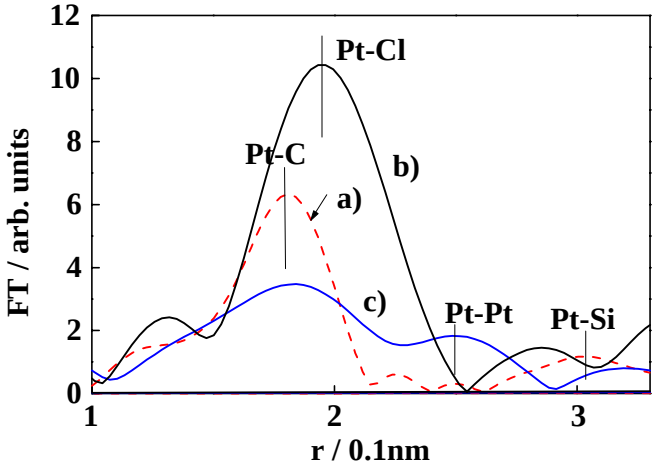

Fig.1 Fourier transforms of Pt L_3 edge EXAFS. a) Pt catalyst before reaction; b) Pt catalyst in the reaction solution of cyclohexene and $HSi(CH_3)Cl_2$ in the presence of MBO; c) Pt catalyst in the reaction solution of cyclohexene and $HSi(CH_3)Cl_2$

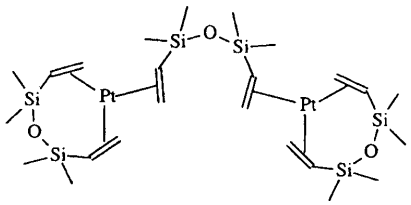

Fig.2 Molecular structure of Pt catalyst.