Singular properties found in Cyclohydrosilane

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We have been conducting a series of studies about liquid silicon made from cyclopentasilane (CPS) which is one of cyclohydrosilane compounds [1]. In this talk, we will introduce some singular properties found in cyclohydrosilane.

CPS can be easily polymerized by irradiation of UV light having a 365 nm wavelength. But the polymerization process is not so comprehensive but difficult to understand. Because CPS has no absorption of the 365 UV light and the increase of molecular weight by UV light has never been observed in linear hydrosilane compounds, where molecular weight is usually reduced by decomposition. Regarding these singular properties, we propose two kinds of mechanisms. One is an orthodox reaction mechanism which includes four step reactions. The other is more rational mechanism based on an idea that hydrosilane polymer is no longer chemically bonded one but collective entity of CPS dimers. We will introduce these mechanisms in this talk.

As a next topic we introduce singular properties which are observed when polyhydrosilane is imprinted. Precise Si nano-patterns can be easily imprinted using polyhydrosilane as a raw material [2]. Imprinting properties of polyhydrosilane is one of the singular ones, because it satisfies two contradictory properties at the same time: fluidity (mobility) at imprinting and solidification (immobility) at demolding. The other singular property can be seen at sintering of imprinted patterns. Larger shrinkage is observed at the lateral direction than the vertical none, resulting in increasing of the aspect ratio in sintering. We will propose hypothesis to explain these singular properties in this talk.

References

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