

The effects of alkyl chain lengths on the emission of PEG-terminated gold(I)-alkane thiolate coordination polymer

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During our recent efforts to synthesize novel soluble gold(I)-thiolate (AuSR) coordination polymers by using PEG-modified thiols, we have found that highly luminescent products are obtained specifically when the thiols with a sufficiently long alkyl spacer were used under certain conditions¹). The critical role of the long alkyl segment is demonstrated by the absence of such photoluminescence (PL) emissions when analogous thiols with a short alkyl spacer were employed. In this work, we synthesized a series of AuSR coordination polymers derived from PEGylated alkanethiols with different alkyl-chain lengths (**C6-C11**), and discuss the relationship between the PL properties and the alkyl spacer.

The synthesis of AuSR from **C6-C11** was performed by the reaction with H₂AuCl₄ in water at 70 °C for 24 h, and the products were purified by ultrafiltration. Except AuSR derived from **C6** (AuS-C6), the AuSR products were PL active. As shown in Fig.1, upon the increase of the alkyl-chain spacer length, the PL bands were enhanced in intensity. For example, the intensity of AuS-C11 was more than ten times larger than that of AuS-C7, and negligible emission was found for AuS-C6. Interestingly, the emission peak position depended on the even/odd character of the carbon number of the alkyl spacers. AuS-C7, AuS-C9, and AuS-C11 showed the emission bands at ~600 nm, whereas the corresponding bands of AuS-C8 and AuS-C10 were observed at red-shifted positions (~610 nm). On the other hands, the UV-Vis absorption and PL excitation spectra of these AuSR were similar to each other, suggesting that the slight difference in the interligand packing of the alkyl segments causes perturbation on the excited state energy.

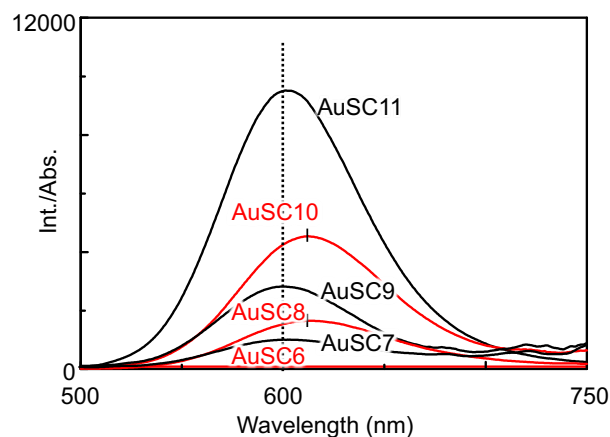
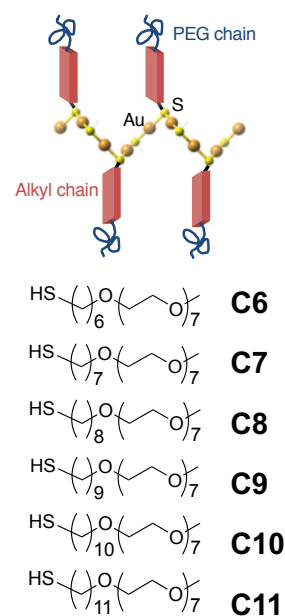


Fig. 1. Photoluminescence spectra ($\lambda_{\text{ex}} = 320$ nm) in water at 20°C of the purified coordination polymers prepared by the reactions of H₂AuCl₄ with **C6-C11** thiols.

1) M. Murakami, R. Matsumine, T. Ono, K. Konishi, *Chem. Lett.* **2020**, 49, 1228.