

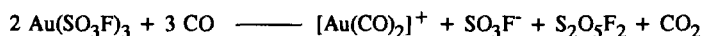
STABILISATION OF THE NOVEL GOLD-CATIONS Au^{2+} AND $\text{Au}(\text{CO})_2^{2+}$ IN SUPERACIDS

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The solution of gold tris(fluorosulfate), $\text{Au}(\text{SO}_3\text{F})_3$, in fluorosulfuric acid, HSO_3F , is a very strong monoprotic superacid [1]. In this system gold(III) can be reduced under mild conditions by CO [2] or gold metal [3]. The reduction of $\text{Au}(\text{SO}_3\text{F})_3$ with CO is described by the overall reaction:



The action of gold metal on $\text{Au}(\text{SO}_3\text{F})_3$ in HSO_3F yields the solvated Au^{2+} cation, which has been characterised by ESR spectra. The ESR signal is strongly dependent on the $\text{Au}^{2+}/\text{Au}(\text{SO}_3\text{F})_3$ ratio. From the saturated solution a red-yellow precipitate of diamagnetic $\text{Au}[\text{Au}(\text{SO}_3\text{F})_4]$ is formed at room temperature. Paramagnetic Au^{2+} ions are also generated as lattice defects in solid $\text{Au}(\text{SO}_3\text{F})_3$ by pyrolysis. The resulting materials are studied by ESR and magnetic susceptibility measurements and represent together with $\text{Au}^{2+}_{(\text{solv})}$ the first unambiguous evidence for the existence of true Au^{2+} cations.

In addition, a solid complex is obtained where $[\text{Au}(\text{CO})_2]^+$ is stabilised by $\text{Sb}_2\text{F}_{11}^-$. The linear cation $[\text{Au}(\text{CO})_2]^+$ is fully characterized by IR-, Raman- and ^{13}C -NMR-spectroscopy. The CO stretching frequencies for $[\text{Au}(\text{CO})_2]^+$ are the highest reported so far. Its force field is compared to those of other carbonyls and the dicyanoaurate(I) ion, $[\text{Au}(\text{CN})_2]^-$. The kinetics of the CO-exchange of $[\text{Au}(\text{CO})_2]^+$ in HSO_3F -solution has been studied.

1 Lee, K.C.; Aubke, F. *Inorg. Chem.* **1979**, *18*, 389.

2 Willner, H.; Aubke, F. *Inorg. Chem.* **1990**, *29*, 2195.

3 Willner, H.; Mistry, F.; Hwang, G.; Herring, F.G.; Cader, M.S.R.; Aubke, F. *J. Fluorine Chem.*, **1991**, *52*, 13.