Chinese Chemical Letters Vol. 16, No. 4, pp 443-444, 2005
http://www.imm.ac.cn/journal/ccl.html


# Triphenylphosphine Stabilized Silver Carboxylates

Jian Lin HAN, Ying Zhong SHEN, Yi PAN*

National 863 Program New Material MO Precursors R&D Center, National Key Lab of Coordination Chemistry, School of Chemistry and Chemical Engineering, Nanjing University, Nanjing 210093

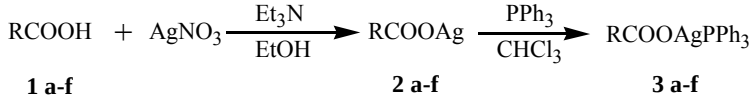
**Abstract:** A series of novel triphenylphosphine stabilized silver carboxylates, potential precursors for CVD growth of ultrafast interconnection link in microelectronic devices, have been prepared and characterized.

**Keywords:** CVD precursor, interconnect, triphenylphosphine, silver carboxylate.

Preparation and processing of thin silver films using chemical vapor deposition (CVD) techniques are widely studied for the last several years due to their applications in modern microelectronic technologies. The needs for the ultrafast interconnections between metals have led to the applications of metals having lower resistivity like silver (1.59 μΩ·cm)[1].

Although several inorganic and organometallic species, including $AgF^2$, ($\beta$-diketonato)$Ag(PR_3)^3$ and (VTES)$Ag(hfac)^4$ (VTES = vinyltriethylsilane), have been reported to be used as CVD precursors, these complexes are both air and moisture-sensitive, with low thermal stability and light sensitivity, therefore they are limited to use for the CVD process. Lewis-base stabilized silver carboxylates are promising candidates as precursors for the deposition of silver. Except a few examples[5-7], they have not been well studied. Most of them are stabilized by two phosphine ancillary ligands. Because of the presence of two bulky phosphine ligands, the volatility of the complexes is generally poor. In order to search for the new precursors, which are more suitable for CVD process, we reported herein a series of novel mono-triphenylphosphine stabilized silver $\alpha$, β-unsaturated carboxylates (**Scheme 1**).

**Scheme 1** The typical experimental procedure




* E-mail: yipan@nju.edu.cn

Synthesis of the complexes were carried out under an atmosphere of purified nitrogen with standard Schlenk techniques. The preparation can be performed successfully by mixing the acid with silver nitrate in the presence of triethylamine and then the coordination of triphenylphine with silver carboxylate proceeded to give the resulted salt. Six different *α, β*-unsaturated carboxylic acids have been used in the preparation. The yields of the products are between 70% to 95% as listed in **Table 1**. The compounds obtained have been characterized by $^{1}$HNMR, $^{13}$CNMR, IR and elemental analysis.

**Table1** Reactions of triphenylphosphine with silver carboxylates

| Entry | R | Product | Yield[a] |
|---|---|---|---|
| 1 | $CH_2$=CH | **3a** | 75 |
| 2 | $CH_3$CH=CH | **3b** | 80 |
| 3 | EtCH=CH | **3c** | 82 |
| 4 | PrCH=CH | **3d** | 70 |
| 5 | $(CH_3)_2$C=CH | **3e** | 90 |
| 6 | PhCH=CH | **3f** | 95 |

a. Isolated yields.

## Acknowledgment

The research funds for Y. Pan from Qin-Lan Program of Jiangsu Province, Kua-Shi-Ji Program of Education Ministry, the Key Lab of Fine PetroChemical Technology of Jiangsu Province and the National 863 High Technology Program are acknowledged.

## References

1. *Handbook of Physical Chemistry: CRC Press*: Boca Raton, FL, **1998.**
2. R. J. H. Voorhoeve, J. Merewether, *J. Electrochem. Soc.*, **1972**, *119*, 364.
3. N. H. Dryden, J. J. Vittal, R. J. Puddephatt, *Chem. Mater.*, **1993**, *5*, 765.
4. K. M. Chi, K. H. Chen, S. M. Peng, G. H. Lee, *Organometallics*, **1996**, *15*, 2575.
5. P. Rőmbke, A. Schier, H. Schmidbaur, *et al*., *Inorg. Chim. Acta*, **2004**, *357*, 235.
6. H. Schmidt, Y. Shen, M. Leschke , *et al*., *J. Organomet. Chem*., **2003**, *669*, 25.
7. D. A. Edwards, M. F. Mahon, K. C. Molloy, V. Ogrodnik, *J. Mater. Chem*., **2003**, *13*, 563.

Received 23 March, 2004