

# SYNLETT Spotlight 415

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

## Potassium Thioacetate

Compiled by Silvia M. Soria-Castro

Silvia M. Soria-Castro was born in 1986 in Córdoba, Argentina. She received her *Licenciatura* in Chemistry in 2008 from the Facultad de Ciencias Químicas at the Universidad Nacional de Córdoba, where she is currently carrying out her Ph.D. under Professor Alicia B. Peñéñory. Her research interest mainly focus on C–heteroatom bond-forming reactions catalyzed by copper.

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### Introduction

Potassium thioacetate (AcSK) is an off-white to light-brown crystalline powder that is air sensitive, hygroscopic, and commercially available. It is soluble in water and stable under standard temperature and pressure (m.p. 173–176 °C).

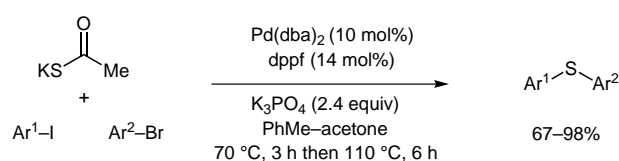
This reagent is widely used as a sulfur source in the synthesis of sulfur-containing organic compounds. The formation of C–S bonds can be easily accomplished by reacting potassium thioacetate with aryl, benzyl, alkyl and vinyl halides or arenediazonium salts, to obtain the corre-

sponding thioesters. A later deprotection allows straightforward access to the thiol since acyl groups may be removed under mild conditions.

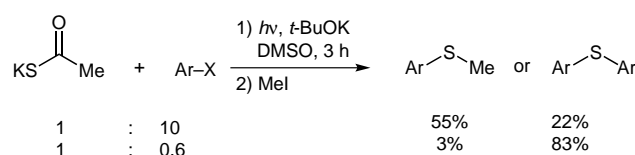
Thus, potassium thioacetate is a versatile reagent that can participate in numerous reactions such as nucleophilic substitutions, transition-metal-catalyzed couplings, photo-induced substitutions, vinylic substitutions and reductive amidation of nitro arenes. Therefore, this reagent has been employed for the synthesis of heterocycles,<sup>1</sup> polymers,<sup>2</sup> transition-metal ligands,<sup>3</sup> nanoparticles,<sup>4</sup> bioactive compounds<sup>5</sup> and macromolecular inclusion complexes.<sup>6</sup>

### Abstracts

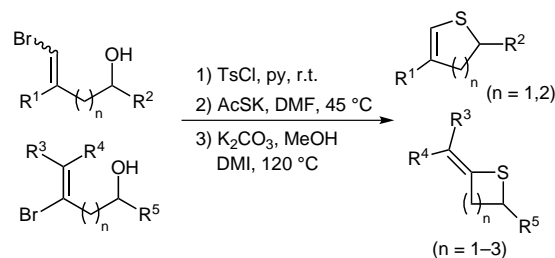
(A) Lee and co-workers developed a one-pot synthesis of symmetrical and unsymmetrical diaryl sulfides by palladium-catalyzed coupling by mixing potassium thioacetate with aryl iodides and bromides.<sup>7</sup> This is a foul-smell-free method that provides tolerance to functional groups.



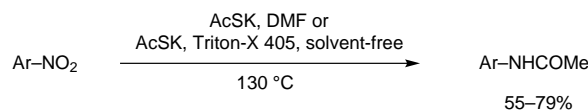
(B) Peñéñory and co-workers prepared aryl methyl sulfides and symmetrical diaryl sulfides alternatively, by photo-induced nucleophilic substitution of aryl halides with potassium thioacetate in the presence of potassium *tert*-butoxide as electron-transfer agent.<sup>8</sup>



(C) Sulfur-containing heterocycles can be synthesized by the intramolecular vinylic substitution of terminal and internal bromoalkenes bearing an acetylthio moiety.<sup>9</sup>



(D) Bhattacharya and co-workers reported a thioacetate-mediated one-step reductive acetamidation of aryl nitro compounds.<sup>10</sup> The reaction could be performed without solvent in the presence of a catalytic amount of surfactant.



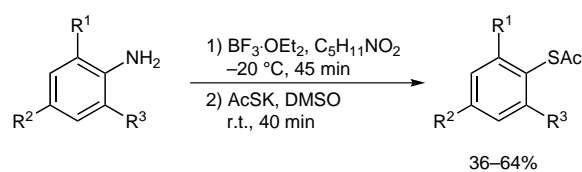
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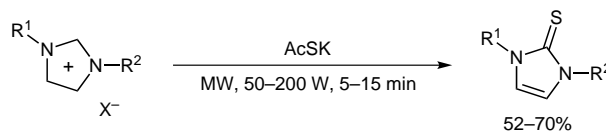
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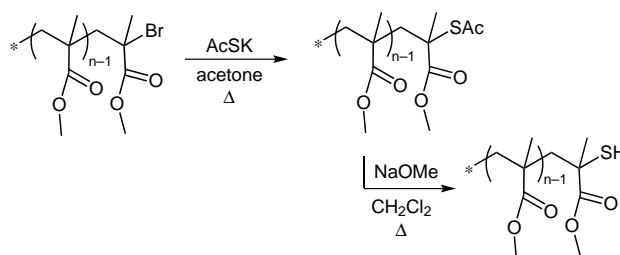
(E) *S*-Acetylarene thiols were synthesized from the corresponding aromatic amines via non-aqueous diazotization and further reaction with potassium thioacetate.<sup>11</sup>



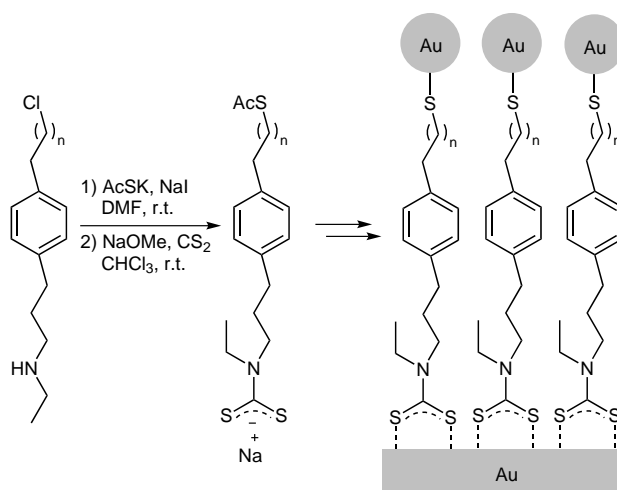
(F) A practical synthesis of 1,3-disubstituted imidazole-2-thiones via a microwave-promoted reaction of imidazolium salts with potassium thioacetate or potassium thiocyanate under solvent-free conditions has been developed.<sup>12</sup>



(G) Paris and co-workers demonstrated that the bromine end-functional group of (meth)acrylic polymers synthesized by atom transfer radical polymerization can be converted into thiol groups in only two steps.<sup>13</sup> Thus, the bromine group was successfully converted into a thioacetate and then into a mercapto group by chemoselective hydrolysis.



(H) The difference in absorption kinetics towards gold surfaces between dithiocarbamate and thioacetate anchor groups was utilized to form oriented assemblies of asymmetric molecules that are bound to gold through the dithiocarbamate moiety.<sup>14</sup> The free thioacetate group was then used to bind gold nanoparticles. Thus, the method is a simple procedure to set up devices with an asymmetric electrode-monolayer–electrode structure.



## References

- (1) Elhalem, E.; Pujol, C. A.; Damonte, E. B.; Rodriguez, J. B. *Tetrahedron* **2010**, *66*, 3332.
- (2) Munro, N. H.; Hanton, L. R.; Moratti, S. C.; Robinson, B. H. *Carbohydr. Polym.* **2009**, *78*, 137.
- (3) Jin, M. J.; Sarkar, S. M.; Lee, D. H.; Qiu, H. *Org. Lett.* **2008**, *10*, 1235.
- (4) (a) Zhu, J.; Waengler, C.; Lennox, R. B.; Schirmacher, R. *Langmuir* **2012**, *28*, 5508. (b) Zhang, S.; Leem, G.; Lee, T. R. *Langmuir* **2009**, *25*, 13855. (c) Huc, V.; Pelzer, K. J. *Colloid. Interf. Sci.* **2008**, *318*, 1.
- (5) (a) Ma, H. J.; Li, Y. H.; Zhao, Q. F.; Zhang, T.; Xie, R. L.; Mei, X. D.; Ning, J. *J. Agric. Food Chem.* **2010**, *58*, 4356. (b) Ohta, C.; Kuwabe, S.; Shiraishi, T.; Shinohara, I.; Araki, H.; Sakuyama, S.; Makihara, T.; Kawanaka, Y.; Ohuchida, S.; Seko, T. *J. Org. Chem.* **2009**, *74*, 8298. (c) Wash, P. L.; Hoffman, T. Z.; Wiley, B. M.; Bonnefous, C.; Smith, N. D.; Sertic, M. S.; Lawrence, C. M.; Symons, K. T.; Nguyen, P. M.; Lustig, K. D.; Guo, X.; Annable, T.; Noble, S. A.; Hager, J. H.; Hassig, C. A.; Malecha, J. W. *Bioorg. Med. Chem. Lett.* **2008**, *18*, 6482.
- (6) Wang, A.; Li, W.; Zhang, P.; Ling, C. C. *Org. Lett.* **2011**, *13*, 3572.
- (7) Park, N.; Park, K.; Jang, M.; Lee, S. *J. Org. Chem.* **2011**, *76*, 4371.
- (8) Schmidt, L. C.; Rey, V.; Peññory, A. B. *Eur. J. Org. Chem.* **2006**, 2210.
- (9) Lei, M.-Y.; Xiao, Y.-J.; Liu, W.-M.; Fukamizu, K.; Chiba, S.; Ando, K.; Narasaka, K. *Tetrahedron* **2009**, *65*, 6888.
- (10) Bhattacharya, A.; Purohit, V. C.; Suarez, V.; Tichkule, R.; Parmer, G.; Rinaldi, F. *Tetrahedron Lett.* **2006**, *47*, 1861.
- (11) Liu, R.; Li, Y.-H.; Chang, J.; Xiao, Q.; Zhu, H.-J. *Asian J. Chem.* **2010**, *22*, 3059.
- (12) Tao, X. L.; Lei, M.; Wang, Y. G. *Synthetic Commun.* **2007**, *37*, 399.
- (13) Liras, M.; Garcia, O.; Quijada-Garrido, I.; Páris, R. *Macromolecules* **2011**, *44*, 1335.
- (14) Gao, D.; Scholz, F.; Nothofer, H. G.; Ford, W. E.; Scherf, U.; Wessels, J. M.; Yasuda, A.; von Wrochem, F. *J. Am. Chem. Soc.* **2011**, *133*, 5921.