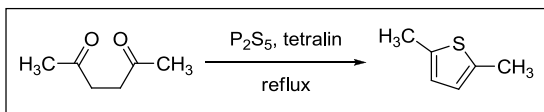
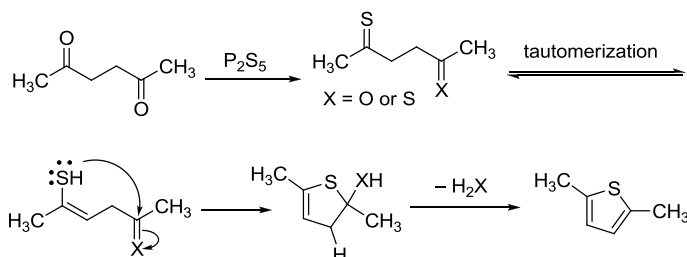


Paal thiophene synthesis

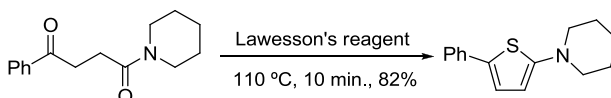
Thiophene synthesis from addition of a sulfur atom to 1,4-diketones and subsequent dehydration.



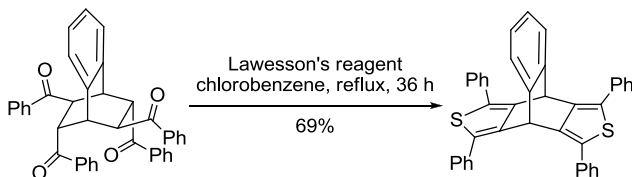
The reaction now is frequently carried out using the Lawesson's reagent. For the mechanism of carbonyl to thiocarbonyl transformation, see Lawesson's reagent.



Example 1²



Example 2³



References

1. (a) Paal, C. *Ber.* **1885**, *18*, 2251–2254. (b) Paal, C. *Ber.* **1885**, *18*, 367–371.
2. Thomsen, I.; Pedersen, U.; Rasmussen, P. B.; Yde, B.; Andersen, T. P.; Lawesson, S.-O. *Chem. Lett.* **1983**, 809–810.
3. Parakka, J. P.; Sadannandan, E. V.; Cava, M. P. *J. Org. Chem.* **1994**, *59*, 4308–4310.
4. Kikuchi, K.; Hibi, S.; Yoshimura, H.; Tokuhara, N.; Tai, K.; Hida, T.; Yamauchi, T.; Nagai, M. *J. Med. Chem.* **2000**, *43*, 409–423.
5. Sonpatki, V. M.; Herbert, M. R.; Sandvoss, L. M.; Seed, A. J. *J. Org. Chem.* **2001**, *66*, 7283–7286.
6. Kiryanov, A. A.; Sampson, P.; Seed, A. J. *J. Org. Chem.* **2001**, *66*, 7925–7929.
7. Mullins, R. J.; Williams, D. R. *Paal Thiophene Synthesis*. In *Name Reactions in Heterocyclic Chemistry*; Li, J. J., Ed.; Wiley: Hoboken, NJ, **2005**, 207–217. (Review).
8. Kaniskan, N.; Elmali, D.; Civcir, P. U. *ARKIVOC* **2008**, 17–29.