Organocatalytic Synthesis of Substituted Furfuryl Alcohols and Amines

**Significance:** The authors present an organocatalytic approach for the synthesis of highly substituted furfuryl alcohols and amines in good to excellent yield. The reaction is catalyzed by tetrahydrothiophene (2), using a Lewis base for the activation of the alkylnylcarbonyl derivatives 1. In contrast to 2, other Lewis bases such as DABCO or Bu3P led to decomposition.

**Comment:** While electrophilic metal-catalyzed furan syntheses are common, organocatalytic approaches are rare. Inspired by the work of Krische (J. Am. Soc. Chem. 2004, 4118) and Kuroda (Tetrahedron 2004, 1913), Clark and co-workers applied a Lewis base activation concept for their reaction. By using tetrahydrothiophene (2) as a catalyst, an enolate is formed that cyclizes to a sulfur ylide containing furan which can react with different nucleophiles. This method can also be used for a multi-component domino synthesis of substituted furans.

**Selected examples:**

- n-Bu
  - SO2Ph: >98% yield
  - BS\(_2\): 45% yield
- n-Bu
  - PMBO: 99% yield
  - BzO: 92% yield
  - SO2Ph: 70% yield

**Proposed mechanism:**

\[
\begin{align*}
R^1 & = \text{Alk, Ar} \\
R^2 & = \text{Alk, Ar, CO}_2\text{Alk, SO}_2\text{Ar, CN, P(O)(OMe)}_3 \\
R^3 & = \text{Alk, Ar, Si(Alk)}_3 \\
\text{Nu} & = \text{OAlk, OAr, CO}_2\text{Alk, CO}_2\text{Ar, NHNs}
\end{align*}
\]

\[
\text{CH}_2\text{Cl}_2, \text{reflux} \quad 24-48 \text{ h}
\]

23 examples up to 99% yield