Much of the chemistry of 1,3-dialdehydes, aldehyde ketones, and diketones already has been mentioned in this chapter and is well illustrated in the properties of 2,4-pentanedione,

\[
\begin{align*}
\ce{O} & \ce{C\equiv O} & \ce{C\equiv O} & \ce{\text{O}} \\
\ce{\text{CH}_3} & \ce{\text{C}} & \ce{\text{CH}_2} & \ce{\text{C}} & \ce{\text{CH}} & \ce{\text{CH}_3} & \rightleftharpoons & \ce{\text{C}} & \ce{\text{\equiv C}} & \ce{\text{O}} \\
\ce{\text{CH}_3} & \ce{\text{CH}} & \ce{\text{CH}} & \ce{\text{CH}_3}
\end{align*}
\]

The liquid ketone exists \(85\%\) in the enol form and is moderately acidic. The \(K_{\text{a}}\) in water is \(10^{-9}\). The enol form is stabilized significantly by both electron delocalization and hydrogen bonding. The amount of enol present at equilibrium depends on the solvent, and is smallest in hydrogen-bonding solvents and largest in nonpolar solvents such as carbon tetrachloride.

The reactions discussed in this chapter that depend on the formation of enolate anions (i.e., halogenation, aldol addition, and alkylation) often proceed smoothly and under milder conditions with 1,3-diketones than with monoketones. This is because the 1,3-diketones are stronger acids and therefore can form the enolate anion with weaker bases. The principal synthetic methods for preparing 1,3-dicarbonyl compounds will be discussed in Chapter 18.

With 2,4-pentanedione, polyvalent metal cations often form very stable and only slightly polar enolate salts, better known as metal chelates. Cupric ion forms a particularly stable dark-blue chelate:

The beryllium chelate of 2,4-pentanedione is another example of a stable chelate; it melts at \(108^\circ\text{C}\), boils at \(270^\circ\text{C}\), and is soluble in many organic solvents. By replacing the methyl groups of 2,4-pentanedione with tert-butyl groups, a diketone is obtained which, with many metals including transition and rare-earth metals, forms complexes that often are highly soluble in nonpolar organic solvents. The interior of these chelates is saltlike but the exterior is hydrocarbonlike and nonpolar, which accounts for the substantial solubility in nonpolar solvents.

**Contributors**