With the *unsteady-state method*, air is then introduced and the change in dissolved oxygen (DO) is monitored until the solution is nearly saturated. In this case,

$$\frac{dC_L}{dt} = k_L a(C^* - C_L) \tag{10.4a}$$

or

$$\frac{-d(C^* - C_L)}{dt/(C^* - C_L)} = k_L a \tag{10.4b}$$
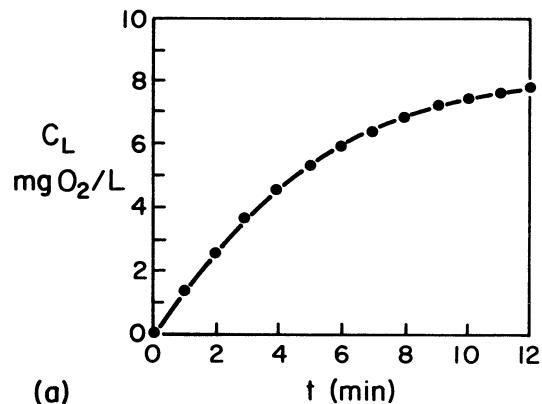
or

$$\ln(C^* - C_L) = -k_L a t \tag{10.5}$$
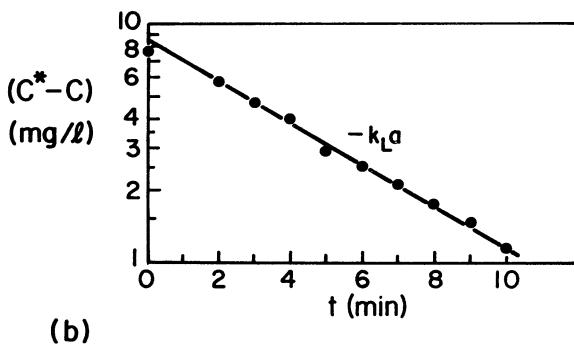
As shown in Fig. 10.4, a plot of log $(C^* - C_L)$ versus time will give an estimate of $k_L a$.

Another approach is the *sulfite method*. In the presence of Cu^{2+}, the sulfur in sulfite (SO_3^{2-}) is oxidized to sulfate (SO_4^{2-}) in a zero-order reaction. This reaction is very rapid, and consequently C_L approaches zero.

The rate of sulfate formation is monitored and is proportional to the rate of oxygen consumption ($\frac{1}{2}$ mol of O_2 is consumed to produce 1 mol of SO_4^{2-}). Thus,

(a)

(b)

Figure 10.4. (a) Typical data for unsteady-state accumulation of oxygen in a large stirred tank. (b) Assuming $C^* = 8.65$ mg O_2/l, a value of $k_L a = 11.5 \ h^{-1}$ is determined. (With permission, from D. W. Sundstrom and H. E. Klei, *Wastewater Treatment*, Pearson Education, Upper Saddle River, NJ, 1979, p. 53.)