



**FIGURE 9** (A) Arrhenius plot of the residence time  $\tau_0$  for different levels of hydration of water: at the surface of H<sub>2</sub>O-hydrated d-CPC protein (*empty symbols*), contained in hydrated Vycor (solid symbols), as compared with bulk water (*empty circles*). (B) Arrhenius plot of the hindered rotations characteristic time,  $\tau_1$ . This time is a measurement of the hydrogen bond lifetime. *Source:* From Refs. 59 and 79.

One sees that the corresponding peaks for hydration water in protein are also shifted slightly upward compared with the bulk water at the same temperature and as it is observed for water confined in Vycor (Fig. 6). The up-shift of the librational peak increases either as the temperature is lowered or the level of hydration is decreased which reflects the amplified effect of confinement (59). This indicates that both the translational and librational motions of water molecules, near or at protein surface, are slightly more hindered, in agreement with observation from computer simulations.