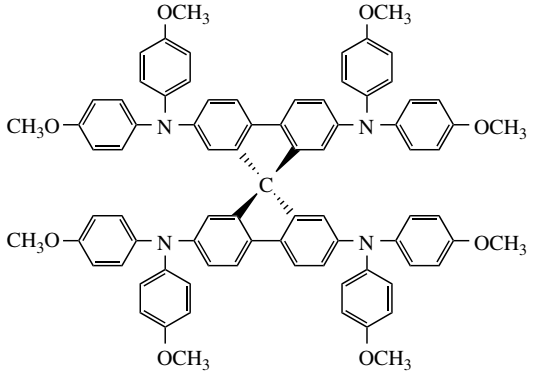
of these ionic liquids can be decreased similarly to that of organic solvents, the solar cell performance will be improved as a result of increased ionic mobility of the electrolyte.

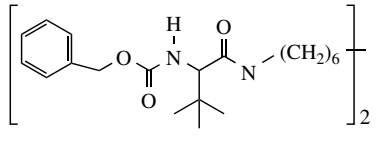
15.3.4 Quasi-solid-state and Solid-state DSSCs

Development of solid-state or quasi-solid-state DSSCs is essential for developing a cell with long-term stability and is critical for commercialization. Because liquid electrolytes using organic solvents are usually utilized in conventional DSSCs, techniques for sealing the cell must be perfectly established to prevent evaporation of components of the electrolyte especially under high temperatures in outdoor applications. In addition, the solid-state DSSC would allow easier interconnection of a cell into a monolithic module.

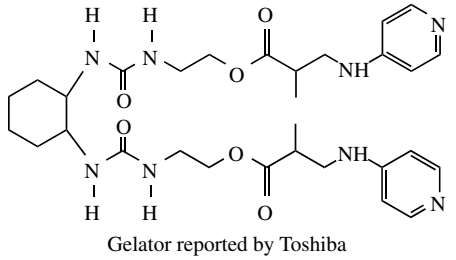
Grätzel and coworkers studied an N3 dye-sensitized nanocrystalline TiO_2 solar cell using a hole-transport material, 2,2′,7,7′-tetrakis(*N*,*N*-di-*p*-methoxyphenyl-amine)9,9′-spirobifluorene (OMeTAD), as a solid electrolyte (Figure 15.14) [149]. OMeTAD is



OMeTAD



L-valine derivative galator



Gelator reported by Toshiba

Figure 15.14 Molecular structures of a solid-state electrolyte and gelator