Topological insulators and superconductors are new quantum states of matter that are characterized by nontrivial topological structures of the Hilbert space [1]. Recently, they attract a lot of attention because of the appearance of exotic quasiparticles such as spin-momentum-locked Dirac fermions or Majorana fermions on their surfaces, which hold promise for various novel applications [2]. In this talk, I will introduce the basics of those materials and present some of the key contributions we have made in this new frontier.