ABSTRACT:
Over the past decade, remarkable efforts have been made to design low-cost, non-toxic, stable and efficient photocatalyst for water splitting. In the present work, an effective alternative approach to enhance hydrogen production of SrTiO$_3$ was by coupling with MWCNT to form heterojunction followed by doping with Zr$^{4+}$ ion. The observed type-II band alignment and the polarised electric field could promote the separation of photoexcited charge carriers and photocatalytic activity of these hybrid heterostructures. The theoretical calculation revealed that Zr$^{4+}$ ion could act as a charge carrier mediator to transfer electrons to the SrTiO$_3$ surface. The MWCNT (6,12,18)/Zr-doped SrTiO$_3$(100) heterostructure exhibited excellent activity due to the combined effect of MWCNT (6,12,18) and Zr-doped SrTiO$_3$(100) monolayers compared with pure SrTiO$_3$. This study offers a novel understanding of designing highly active and stable SrTiO$_3$-based photocatalyst as efficient hydrogen generation material.