abstract
Lithium-ion batteries can fail and catch fire when overcharged, exposed to high temperature or short-circuited due to the highly flammable organic liquid used in the electrolyte. Using inorganic solid electrolyte materials can potentially improve the safety factor. Additionally, nanostructured electrolyte materials are expected to display further enhanced performance by taking advantage of their large aspect ratio. In this work, the synthesis of two promising nanostructured solid electrolyte materials was explored. Amorphous lithium niobate nanowires were synthesized through the decomposition of a niobium-containing complex in a structure-directing solvent using reflux method. Lithium lanthanum titanate was obtained via solid state reaction with titanium oxide nanowires as the titanium precursor, but the nanowire morphology could not be preserved due to high temperature sintering. We discovered a hyperbranched structure of potassium lanthanum titanate through the hydrothermal route. It was for the first time that hyperbranched nanowires with perovskite structure were synthesized without any catalyst or substrate. The nanowires were found to grow along certain fixed crystallographic directions. The growth mechanism was proposed to be governed by the nucleation and growth processes. This result has the potential to be applied to other perovskite materials to form nanowires and other complex nanosized hierarchical architectures.