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One-dimensional titanate nanotube materials: heterogeneous solid catalysts for sustainable synthesis of biofuel precursors/value-added chemicals—a review

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ABSTRACT:

One-dimensional (1D) titanate nanotubes materials (protonated titanate nanotube (HTNT) and sodium titanate nanotube (NaTNT)) have been reported as low-cost and efficient catalytic materials in chemical syntheses for the production of biofuel precursors with interesting catalytic performance exhibited, even better than some commonly used zeolites, H-MOR, H- β , $\text{SO}_4^{2-}/\text{Al}_2\text{O}_3$, and H-ZSM-5 solid catalysts with environmental benign in focus when compared with homogeneous catalytic materials. This mini-review expressly revealed the significance and potential of using HTNT and NaTNT as sustainable and environmentally benign solid catalysts/supports in various chemical reactions. The critical assessment of biomass valorization and titanate nanostructured materials as catalysts/supports via Green Chemistry approach, #7 (use of renewable feedstocks), #9 (use of catalyst against stoichiometry) and United Nations (UN) Sustainable Development Goals (SDGs), #7 (affordable and clean energy; ensure access to inexpensive, reliable, sustainable, and new energy), is presented as integrated pathways to meet environmental benign technology toward sustainability. Hence, this work follows in the pattern of recent formulated features reported for solid catalysts—‘PYSSVR’ concept, which means P–production cost, Y–yield, S–stability, S–selectivity, V–versatility, and R–reusability.