Solid-Supported Heterogenized Palladium Nanoparticles: Propitious Vehicles for Sonogashira Cross-Coupling Reaction

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Sonogashira reaction is an important C–C cross-coupling reaction employed for the synthesis of biologically active aryl or vinyl acetylenes using terminal acetylenes and aryl or vinyl halides, in the presence of Pd/Cu salt or Pd metal catalysts.[1,2] Aryl and vinyl acetylenes are structural moieties in polymers, natural products, agrochemicals, and pharmaceuticals. Their constant demand stimulates the upgrading of their synthetic methodologies and the design of newer catalysts.[3]

Currently, the worldwide demand for palladium surpasses the supply, leading to the excessive cost of the catalysts.[4] Therefore, sustainable use and recycling of Pd is vital. Nanocatalysis is a green and benign approach, which is desirable for sustainability and economic viability.[5] These catalytic systems are cheap, ligand-free, and are generally stable to air and moisture.[5] Nanoparticles (NPs) with controlled compositions, uniform and low particle sizes, high number of surface atoms, large surface area, shape selectivity, zeta potential values, and superior surface chemistry exhibit tailorable catalytic properties and selectivity.[6] Selection of a suitable solid support for nanocatalysts is critical as it not only controls the shape, size, and distribution of NPs on its surface but also eases a cooperative and efficient pathway to achieve the target product through strong metal-support interaction (SMSI), high surface area, a substantial number of participating active sites, increased stability, decreased leaching and agglomeration of metal nanoparticles and increased recyclability.[7,8] Solid-supported heterogenized Pd nanoparticles are now being explored as useful

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