HIGHLY CROSSLINKED MICROSPHERES BY TYPE II PHOTOINITIATED PRECIPITATION POLYMERIZATION

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Highly crosslinked polymer microspheres have been extensively investigated due to their great potential in materials science. Among various preparation methods for obtaining such particles, precipitation polymerization (PP) is arguably the most popular due to its easy operation, and highly crosslinked microspheres with clean surfaces can routinely be prepared in the absence of a surfactant or stabilizer by this method. So far, distillation PP, and photoinitiated PP, which are based on the conventional free radical polymerization mechanism, have been developed for the preparation of uniform and cross-linked spherical polymer particles. More recently, reversible-deactivation radical polymerizations, including atom transfer radical polymerization (ATRP), reversible addition-fragmentation chain transfer (RAFT), and iniferter polymerization are successfully combined with PP for the synthesis of highly crosslinked and micron-size polymer microspheres with “living” chain ends on their surfaces.

In this study, a simple one pot and one step synthetic strategy is reported for the preparation of highly crosslinked microspheres with click functionality [1]. In this approach, a tertiary amine wit acetylene functionality, namely 3-dimethylamino-1-propyne (DAP), is used in combination with benzophenone as a bimolecular photoinitiation system. 1-azidomethyl pyrene is then attached onto polymer particles by “click chemistry” to show the presence and accessibility of the alkyne groups on the polymer microspheres. The reaction operates at room temperature and it benefits from the inherent characteristic of PP, in that there is no need for a stabilizer or surfactant of any type. To the best of our knowledge, this is the first report combining type II photoinitiation with PP for the synthesis of highly crosslinked microspheres.

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[1] T.C. Bicak, Highly Crosslinked and Clickable Poly(divinylbenzene) Microspheres by Type II Photoinitiated Precipitation Polymerisation, Macromolecular Chemistry and Physics, 2021, in press.