Silicone Nanofilament Coatings as Flexible Catalyst Supports for a Knoevenagel Condensation Reaction in Batch and Flow Systems

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In this work, the application of silicone nanofilament (SNF) coatings as catalyst supports for amino moieties from (3-aminopropyl)triethoxysilane (APTES) was investigated. During the past years, our group has established a highly facile method to grow SNF on substrates via a droplet-assisted growth and shaping (DAGS) approach at room temperature [1]. With the optimized coating conditions identified, the Brunauer–Emmett–Teller surface areas of a bare glass filter substrate and bare glass beads after the coating have increased by 5-fold and 16-fold, respectively. The SNF-coated filters were readily functionalized with amino groups via a liquid-phase deposition process, and their catalytic activities for a Knoevenagel reaction were evaluated using a batch reactor and a packed bed reactor. In both reactors, the as-prepared filters demonstrated superior catalytic performance over the functionalized filters without SNF coatings. Notably, the unique flexibility of the SNF coatings allowed the facile preparation of a packed bed reactor and a scalable catalytic system. It is expected that the packed bed system established in this study will support the development and the use of various SNF-supported organocatalysts and catalytic materials.

[1] Georg Artus, Stefan Jung, Jan Zimmermann, Hans-Peter Gautschi, Klaus Marquardt, and Stefan Seeger, *Advanced Materials*, **2006**, 18, 2758-2762.