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Chem Biochem Eng Q. 2007;21:321–6.CAS Google Scholar Page 2 Biocatalyst (mg/mL) Alcohol dehydrogenase reaction (ADH) Aldehyde dehydrogenase reaction (ALDH) 3HP Yield d mol% (24 h) 1,3PDO (mg/mL) Remaining 1,3PDO (mg/mL) Conversiona (%) Substrateb (mg/mL) 3HPA (mg/mL) 3HP (mg/mL) Conversionc (%) 5.2 5 0.2 95.3 4.6 0.2 5.4 95.0 95.4 5.2 10 1.4 86.1 8.4 0.1 10.1 98.9 96.9 5.2 15 7.7 48.7 7.1 0.1 8.6 99.1 97.1 5.2 20 13.7 31.3 6.1 0.1 7.3 98.6 96.6 5.2 25 18.9 24.5 6.0 1.4 5.5 76.0 98.5 5.2 30 24.8 17.2 5.0 1.6 4.2 68.0 98.3 2.6 10 4.5 54.9 5.4 0.0 6.5 99.7 98.5e 3.9 10 2.4 75.7 7.4 0.1 8.9 99.0 97.8e 6.5 10 2.0 80.2 7.8 0.2 9.3 98.1 95.8e 1,3PDO 1,3-propanediol, 3HPA 3-hydroxypropionaldehyde, 3HP 3-hydroxypropionic acid aConversion of 1,3PDO bSubstrate calculated as the sum of 3HPA and 3HP used in the ALDH reaction (converted to 3HPA equivalent) cConversion of 3HPA to 3HP dOverall yield (mol%) of 3HP from 1,3PDO after 24 h ecalculated after 12 h Working off-campus? Learn about our remote access options First published: 19 January 2020 The demand for acrylic acid continues to increase rapidly due to its widespread application. The traditional production of acrylic acid originates from non-sustainable propylene oxidation. Considering the environmental requirements and economic sustainable development, it is of great significance to exploit new routes to replace the petrochemical route. Comparison of silica aerogel-supported SiW/PW/PMo catalysts shows that PW/SiO_2 catalyst with 30 wt% loading and calcined at 450 °C provides the best performance for the condensation of acetic acid and formaldehyde. Increasing the reaction temperature from 340 to 400 °C leads to the best acrylic acid selectivities of 87.1–84.2% at formaldehyde conversions of 35.7–45.2%. The catalytic performance of PW/SiO_2 catalyst increases with increasing PW loading. The acidic and basic sites of the catalyst, especially the weak ones, are of vital importance to the synthesis of acrylic acid via the aldol condensation of acetic acid and formaldehyde. The direct polymerization of acrylic acid (AA) in aqueous solution for high molecular weight by means of living radical polymerization is still difficult. Here, AA was polymerized homogeneously in water by a reversible addition-fragmentation transfer polymerization (RAFT) in the presence of a water-soluble trithiocarbonate as a RAFT agent. Various ratios [AA]:[RAFT agent] were investigated to aim at different molecular weights. The polymerization exhibited living free-radical polymerization characteristics at different ratios [AA]: [RAFT agent]: controlled molecular weight, low polydispersity and well-suited linear growth of the number-average molecular weight, M_n with conversion. The chain transfer to solvent or polymer was suppressed during the polymerization process, thus high linear PAA with high molecular weight and low PDI can be obtained. Moreover, using the generated PAA as a macro RAFT agent, the chain extension polymerization of PAA with fresh AA displayed controlled behavior, demonstrated the ability of PAA to reinitiate sequential polymerization.