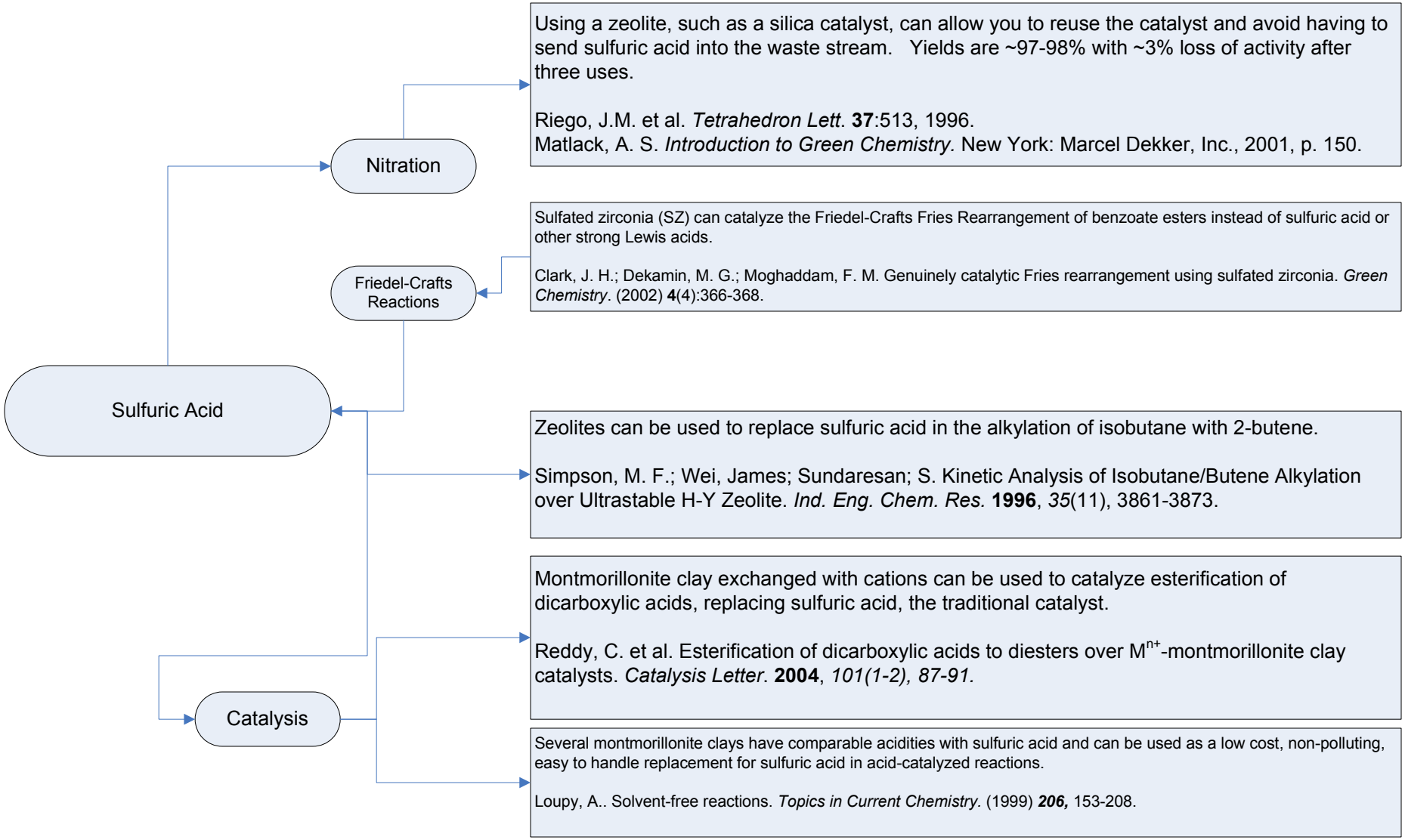
Sulfuric Acid
Nitration
Using a zeolite, such as a silica catalyst, can allow you to reuse the catalyst and avoid having to send sulfuric acid into the waste stream. Yields are ~97-98% with ~3% loss of activity after three uses.
Riego, J.M. et al. Tetrahedron Lett. 37:513, 1996.
Matlack, A. S. Introduction to Green Chemistry. New York: Marcel Dekker, Inc., 2001, p. 150.
Friedel-Crafts Reactions
Sulfated zirconia (SZ) can catalyze the Friedel-Crafts Fries Rearrangement of benzoate esters instead of sulfuric acid or other strong Lewis acids.
Clark, J. H.; Dekamin, M. G.; Moghaddam, F. M. Genuinely catalytic Fries rearrangement using sulfated zirconia. Green Chemistry. (2002) 4(4):366-368.
Zeolites can be used to replace sulfuric acid in the alkylation of isobutane with 2-butene.
Simpson, M. F.; Wei, James; Sundaresan; S. Kinetic Analysis of Isobutane/Butene Alkylation over Ultrastable H-Y Zeolite. Ind. Eng. Chem. Res. 1996, 35(11), 3861-3873.
Catalysis
Montmorillonite clay exchanged with cations can be used to catalyze esterification of dicarboxylic acids, replacing sulfuric acid, the traditional catalyst.
Reddy, C. et al. Esterification of dicarboxylic acids to diesters over Mn+-montmorillonite clay catalysts. Catalysis Letter. 2004, 101(1-2), 87-91.
Several montmorillonite clays have comparable acidities with sulfuric acid and can be used as a low cost, non-polluting, easy to handle replacement for sulfuric acid in acid-catalyzed reactions.
Loupy, A.. Solvent-free reactions. Topics in Current Chemistry. (1999) 206, 153-208.