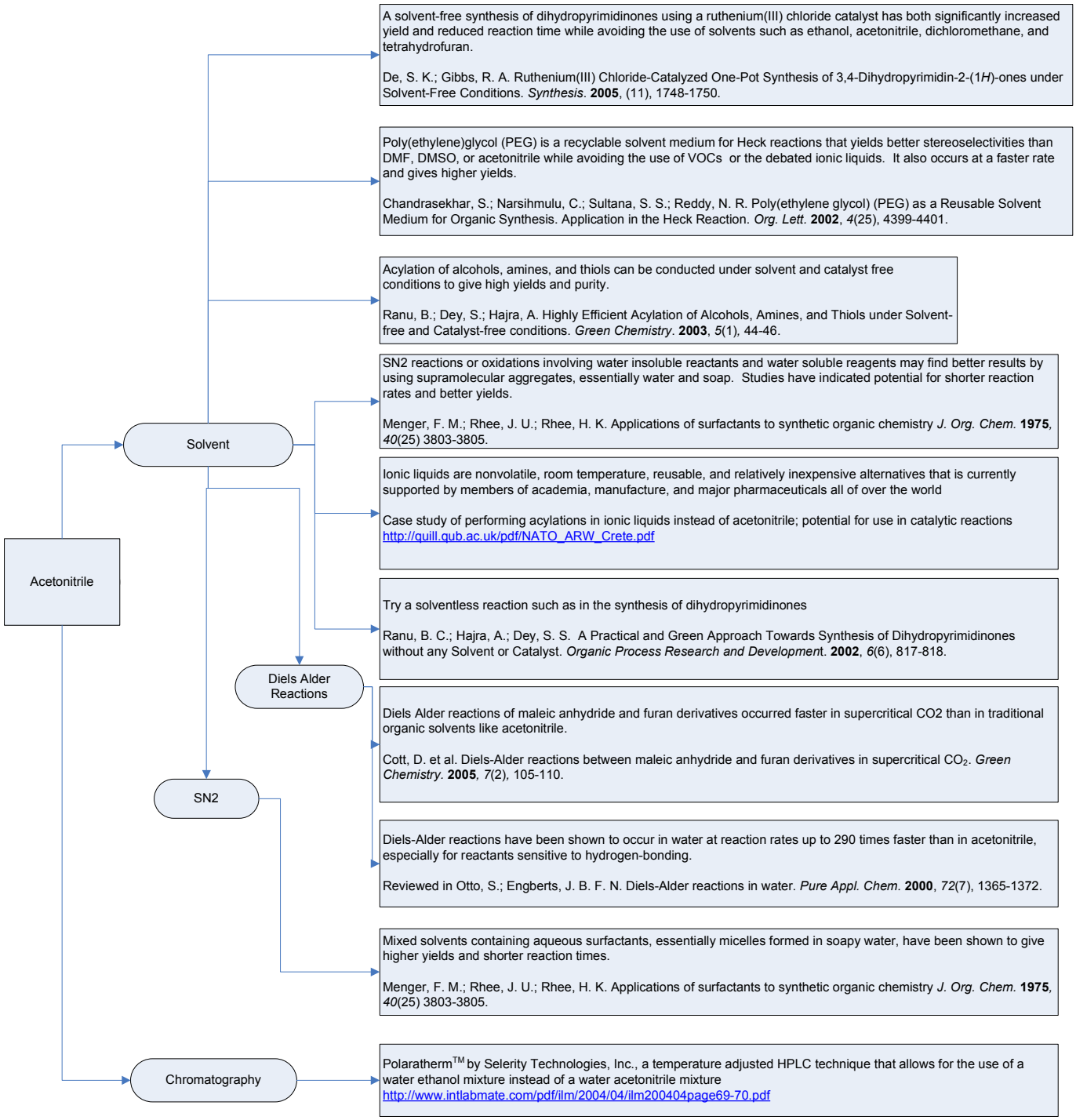
Acetonitrile
Solvent
Diels Alder Reactions
SN2
Chromatography
A solvent-free synthesis of dihydropyrimidinones using a ruthenium(III) chloride catalyst has both significantly increased yield and reduced reaction time while avoiding the use of solvents such as ethanol, acetonitrile, dichloromethane, and tetrahydrofuran.
De, S. K.; Gibbs, R. A. Ruthenium(III) Chloride-Catalyzed One-Pot Synthesis of 3,4-Dihydropyrimidin-2-(1H)-ones under Solvent-Free Conditions. Synthesis. 2005, (11), 1748-1750.
Poly(ethylene)glycol (PEG) is a recyclable solvent medium for Heck reactions that yields better stereoselectivities than DMF, DMSO, or acetonitrile while avoiding the use of VOCs or the debated ionic liquids. It also occurs at a faster rate and gives higher yields.
Chandrasekhar, S.; Narsihmulu, C.; Sultana, S. S.; Reddy, N. R. Poly(ethylene glycol) (PEG) as a Reusable Solvent Medium for Organic Synthesis. Application in the Heck Reaction. Org. Lett. 2002, 4(25), 4399-4401.
Acylation of alcohols, amines, and thiols can be conducted under solvent and catalyst free conditions to give high yields and purity.
Ranu, B.; Dey, S.; Hajra, A. Highly Efficient Acylation of Alcohols, Amines, and Thiols under Solvent-free and Catalyst-free conditions. Green Chemistry. 2003, 5(1), 44-46.
SN2 reactions or oxidations involving water insoluble reactants and water soluble reagents may find better results by using supramolecular aggregates, essentially water and soap. Studies have indicated potential for shorter reaction rates and better yields.
Menger, F. M.; Rhee, J. U.; Rhee, H. K. Applications of surfactants to synthetic organic chemistry J. Org. Chem. 1975, 40(25) 3803-3805.
Ionic liquids are nonvolatile, room temperature, reusable, and relatively inexpensive alternatives that is currently supported by members of academia, manufacture, and major pharmaceuticals all of over the world
Case study of performing acylations in ionic liquids instead of acetonitrile; potential for use in catalytic reactions
http://quill.qub.ac.uk/pdf/NATO_ARW_Crete.pdf
Try a solventless reaction such as in the synthesis of dihydropyrimidinones
Ranu, B. C.; Hajra, A.; Dey, S. S. A Practical and Green Approach Towards Synthesis of Dihydropyrimidinones without any Solvent or Catalyst. Organic Process Research and Development. 2002, 6(6), 817-818.
Diels Alder reactions of maleic anhydride and furan derivatives occurred faster in supercritical CO2 than in traditional organic solvents like acetonitrile.
Cott, D. et al. Diels-Alder reactions between maleic anhydride and furan derivatives in supercritical CO2. Green Chemistry. 2005, 7(2), 105-110.
Diels-Alder reactions have been shown to occur in water at reaction rates up to 290 times faster than in acetonitrile, especially for reactants sensitive to hydrogen-bonding.
Reviewed in Otto, S.; Engberts, J. B. F. N. Diels-Alder reactions in water. Pure Appl. Chem. 2000, 72(7), 1365-1372.
Mixed solvents containing aqueous surfactants, essentially micelles formed in soapy water, have been shown to give higher yields and shorter reaction times.
Menger, F. M.; Rhee, J. U.; Rhee, H. K. Applications of surfactants to synthetic organic chemistry J. Org. Chem. 1975, 40(25) 3803-3805.
Polaratherm™ by Selerity Technologies, Inc., a temperature adjusted HPLC technique that allows for the use of a water ethanol mixture instead of a water acetonitrile mixture
http://www.intlabmate.com/pdf/ilm/2004/04/ilm200404page69-70.pdf