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# A review on one-pot synthesis of acrylic acid from glycerol on bi-functional catalysts

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## Abstract

Oxydehydration is one of the possible reactions to valorize glycerol to acrylic acid that has high demand in industry. Glycerol oxydehydration is a two-step reaction that is an interesting, yet challenging approach to give high acrylic acid yield. The reaction consists of the dehydration to 3-hydroxypropanal and subsequently to acrolein catalyzed by mainly Brønsted acid sites. Selective oxidation catalyzed by metal sites should then be carried out to form acrylic acid. A single-step or one-pot conversion requires a multi-component catalyst addressing the requirements of both steps to selectively form the desired product. Strong acid sites will catalyze the undesired glycerol oxidation reactions while metals with high redox capability tend to cause oxidative decomposition of acrolein. This work reviews the recent works on glycerol catalytic oxydehydration to form acrylic acid in a one-pot approach. The complete reaction mechanism and specific requirements are elucidated. Main focus is given to the pros and cons of four groups of catalysts i.e. vanadium pyrophosphates, supported heteropoly acids, mixed metal oxides and molecular sieves. The roles of specific acid sites, type and composition of active components and redox strength of active components are critically reviewed.