PROCESS FOR ACRYLATE PRODUCTION

CROSS REFERENCE TO RELATED APPLICATIONS

The present application claims priority to U.S. provisional application serial number 61/667,101 filed July 2, 2012, the entire content of which is hereby incorporated herein by reference.

FIELD OF THE INVENTION

The invention pertains to the field of chemical synthesis. More particularly, the invention pertains to continuous flow processes for the synthesis of acrylates from epoxide feedstocks.

SUMMARY ~~OF THE INVENTION~~

The present ~~invention~~ disclosure encompasses methods for the continuous flow production of acrylic acid and derivatives thereof from an epoxide feedstock.

In a first aspect of the present disclosure, there is provided a method for the production of an acrylate ester from ethylene oxide in a continuous flow process, the method comprising the steps of:

a) contacting a process stream comprising ethylene oxide and an organic solvent with a carbonylation catalyst in the presence of carbon monoxide to provide a reaction stream containing beta propiolactone formed from the ethylene oxide;

b) applying the reaction stream containing the beta propiolactone to a nanofiltration membrane to produce:

i) a permeate stream comprising beta propiolactone and a first portion of the organic solvent, and

ii) a retentate stream comprising carbonylation catalyst and a second portion of the organic solvent; and

c) treating the permeate stream under conditions to convert the beta propiolactone into an acrylate ester.

In a second aspect of the present disclosure, there is provided a method for the production of poly(3-hydroxy propionic acid) from ethylene oxide in a continuous flow process, the method comprising the steps of:

a) contacting a process stream comprising ethylene oxide and an organic solvent with a carbonylation catalyst in the presence of carbon monoxide to provide a reaction stream containing beta propiolactone formed from the ethylene oxide;

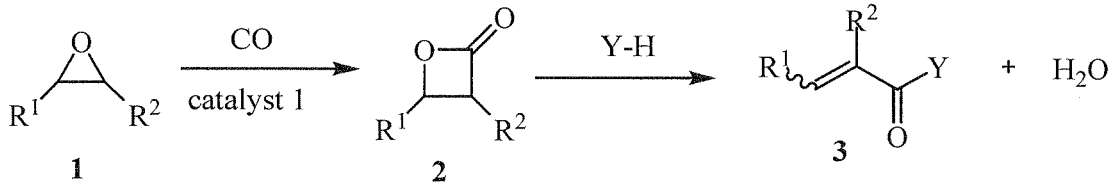
b) applying the reaction stream containing the beta propiolactone to a nanofiltration membrane to produce:

i) a permeate stream comprising beta propiolactone and a first portion of the organic solvent, and

ii) a retentate stream comprising carbonylation catalyst and a second portion of the organic solvent; and

c) treating the permeate stream under conditions to convert the beta propiolactone into poly(3-hydroxy propionic acid).

In one ~~aspect~~embodiment, shown in Scheme 1, the method includes the steps of: contacting an epoxide **1** with a carbonylation catalyst to yield a beta lactone **2**; separating a beta lactone product stream from the carbonylation catalyst; and treating the beta lactone under conditions that cause conversion to an acrylate **3**.



1 **2** **3**

Scheme 1

In certain embodiments the carbonylation step is performed in the presence of an organic solvent and the separation of the beta lactone product is performed by nanofiltration on a nanofiltration membrane. This produces two process streams: a permeate stream of the beta lactone product in a portion of the organic solvent passing through the nanofiltration membrane and a retentate stream containing the carbonylation catalyst retained by the nanofiltration membrane and the remainder of the organic solvent. In some embodiments, this