הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע״ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Special Seminar

Lecture Hall 6, Wolfson Department of Chemical Engineering,

Wednesday 14.6.2017 at 13:30

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Development of a Technical Route for Production of Hydrogenated Nitrile Butadiene Rubber Latex

Abstract

Catalytic hydrogenation of the carbon-carbon double bonds in diene-based polymers, such as nitrile butadiene rubber (NBR), styrene-butadiene rubber (SBR) and several other performance-demanding rubbers, is an important process as the hydrogenated products (e.g., HNBR and HSBR) become so-called high performance elastomers, which are more resistant than their parent polymers towards oxidative and thermal degradation while maintaining their elastomeric properties in chemically aggressive environments and which have found important applications in manufacturing automobile components and oil drilling devices. The commercial process for these high performance elastomers involves a number of cumbersome steps; the production of HNBR, for example, in a batch-wise mode, includes purifying NBR from the latex, dissolving the NBR in a large amount of organic solvent, and recovering the organic solvent after the hydrogenation operation. Such a process is not friendly with the environment and also costly. It is very desirable to develop ways so that the catalytic hydrogenation of the diene-based polymers can be realized in a green and economical manner, which has been pursued in our research for a number of years.

Direct hydrogenation of NBR in its aqueous latex form is energetically favourable and environmentally friendly. It could open a door to produce HNBR latex which has latent value in the painting and coating industries. Currently, the core challenges in NBR latex hydrogenation come from the areas including 1) exploring active catalysts 2) averting the use of an organic solvent 3) controlling the cross-linking side reaction and 4) separating the residual catalyst. By synergically coupling the parent polymerization and the subsequent hydrogenation, a novel route for producing HNBR latex is developed and will be presented here. The proper polymerization recipe is prepared to meet the catalyst systems such as the Grubbs type catalysts including second generation Grubbs catalyst (G2) and second generation Hoveyda-Grubbs catalyst (HG2). Therefore, the direct hydrogenation operation of diene-based polymer latex can be potentially integrated into the commercial polymerization process for the parent polymer synthesis, as the conventional route for polymer synthesis are emulsion polymerization and its convenient products are in the latex form.

<u>Bio-sketch:</u> Dr. Wang is a Research Scientist in ICES. He received the PhD in Polymer Science and Engineering from Advanced Rubber Technology Lab in Chemical Engineering, University of Waterloo, Canada. Dr. Wang's research has been funded by the Lanxess (Germany) for a long term.

His contribution to the Lanxess has led to the patent-transfer-technology on the commercialization of first successful catalytic latex hydrogenation of rubber in the world in 2016 (production site located in Germany).

Research Interests: Semi-batch reactor technology for gradient copolymers; Polymer synthesis; Emulsions/microemulsion/Pickering emulsion/latex; Surfactant technology; Hydrogenation of polymer; Advanced targeted drug delivery; Supercritical technology for catalytic reaction and catalyst recovery; Enhanced oil recovery.

Refreshments will be served at 13:15