SCO-Young Scientist Profile

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Details of research work carried out in S&T (*limit to 200 words*)

Ethylene from bioethanol produced from feedstocks having no food value is a promising source for low-tonnage production of innovative products. The specificity of developing such technologies, particularly low-tonnage, requires an integrated approach to biotechnology and catalytic technology.
Chemical pretreatment of biomass can considerably affect the product quality and the technological indexes of the subsequent process. Nitric acid and sodium hydroxide are most widely used, which determine not only the ethanol yield from biomass but also the content of its impurities.
It was found pretreatment of oat hulls with nitric acid is preferable for ethylene production because it contributes to fewer impurities in ethanol and results in a higher ethylene productivity per unit weight of oat hulls.
The undiluted ethanol dehydration to ethylene was carried out on an alumina catalyst in a tubular reactor. For this endothermic process, it was found that the average integral temperature determines the catalyst activity per unit bed volume, and an effective way to the temperature control in the reactor is variation in grains of shape and size. The geometrical dimensions of grains were determined, which ensure the highest catalytic activity at the permissible values of mechanical strength and at the smallest hydraulic resistance.

Associated SCO-YSC Theme:

Statement of Innovation ***(Brief information on new innovative ideas including startup / entrepreneurs- limit to 150 words)***

Until recently, the development of biotechnology and catalytic technology took place in isolation. But this approach couldn't be optimal when implementing a complete cycle of production of organic chemicals from renewable bioresources. The specificity of developing such technologies, particularly low-tonnage, requires an integrated approach in order to simplify the technology, reduce costs at the stages of purification and conditioning of intermediate and final products, and improve techno-economic indicators.

Major awards/ Achievements ***(Upto 3 awards)***

Possible collaboration with SCO countries ***(limit to 100 words)***

Cellulosic materials constitute a large proportion of the agro-residues. Bioethylene production

can be promising possibilities for the industrial utilization of agro-residues. Wastes from catalytic and bio-technologies should be utilized for sustainable closed-loop technology development. Some perspective issues for collaboration in the development of sustainable technology for wastes conversion to widely demanded products is at the intersection of bio- and catalytic technologies:
Effect of a pretreatment on the bioethanol composition, on a liquid wastes formation;
Effect of bioethanol impurities on the bioethylene production;
Effect of catalytic process conditions on liquid wastes composition and organosolv-type pretreatment;

Key words ***(relevant to research work conducted as well as proposed innovation, 5-6 words)***
nitric pretreatment of biomass, ethanol to ethylene dehydration, alumina catalyst, ring-shaped granules, pilot set-up, temperature profile.