

Oxidative Dehydrogenation of Butane by Modified Graphitic Catalysts

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Extended Abstract

Polymers are important synthetic material using as fabrics, coating materials and plastics. These polymers are produced by polymerizing monomers with double bonds. The 1,3-butadiene (BD) and butene are high value product which consist of 4 carbons and π -bonds so that can produce a variety of macro-molecules like acrylonitrile-butadiene-styrene (ABS) polymer, acrylonitrile butadiene (NBR) and styrene-butadiene (SBR). The most well-known methodology to obtain BD is the catalytic dehydrogenation of n-butane (BT). The metal oxide catalysts have been widely used for the oxidative dehydrogenation (ODH) to BD [3]. The characteristic of these catalysts is oxygen vacancy in oxide which delivers oxygen easily [1,3]. It has been reported that carbon materials show the good selectivity for the ODH of paraffin to olefin. The nano-structured carbon materials are suitable for support owing to large surface area [2,4].

In this experiment we used the catalysts modified carbon materials, graphene, graphite, graphene oxide, carbons which were potassium added. The different kinds of carbons were added to aqueous solution of ammonium molybdenum tetrahydrate, and the mixture was dried and calcined at 400 °C for 1 h in air. The carbon composite catalyst (1g) was put in a cylindrical fixed bed reactor in which air, steam and butane gas were supplied. Flow rates of gases were changed in 4ml/min to 80ml/min. The temperature of reactor ranges from 400 °C to 600 °C.

The concentrations of produced compounds were analyzed by gas chromatography (GC; CP7515 capillary column, VARIAN). The effect of reaction temperature, ratio of oxygen to butane and the presence of potassium ions were investigated on the catalytic activities and product selectivity. The kind of carbon catalysts were compared in the ODH reaction. The graphene showed the best selectivity to BD, as compared to other carbon species. As the reaction temperature increased, the BT conversion and selectivity of BD was increased. The increasing ratio of oxygen to butane has resulted in the increase of selectivity of BD. Potassium ions added effected on ratio of 2-butene to BD which is related isomerization reaction.

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