T18-284

Tohoku University's Invention

A catalyst for polyolefin plastic hydrogenolysis

Low reaction temperature, high selectivity for oil, and good reusability!

Introduction

Mentioning of hydrogenolysis of plastics, e.g. the polyoleifin family, the low catalyst selectivity for product, the tedious procedure for catalyst's reuse, as well as the high reaction temperature, all restrict the application and improvement of this technique. This invention displays a resolution via using Ru as catalyst lying on the supporters metallic oxides (hereafter, Catalyst) .

Effect

・When hydrogenolysis of polyethylene, a typical polyoleifin, only Ru as catalyst on metallic oxide supporters shows high catalytic activity and selectivity for oil (Table 1). The reaction temperature is set as 240 °C, which is lower than conventional methods. Moreover, varying molecular weight of polyethylene, the reactivity of this catalyst is confirmed to be maintained.

・Reuse of this solid catalyst can be done simply by filtration. The catalytic activity does not decrease even after several times of recycling (Table 2), implying its good reusability.

・The product oil, especially of liquid fuel has a huge market and lubricating oil has a high added-value. Hydrogenolysis of polyethylene by the Catalyst avoids conventional burning process. It is thus expected to be explored widely in industry as a method with so many merits, such as friendly to environment, low cost, etc.

Table 1：Decomposition reaction of polyethylene by Ru/CeO_2

	Temp. (°C)	Time (h)	Conv. (%)	Yield (%)			
				Gas (C1-C4)	Liquid fuel (C5-C21)	Heavy oil (C22-C45)	Lubricating oil (C15-C45)
Ru	240	5	76.4	7.4	53.5	14.3	37.2
Ir	260	24	2.9	1.3	1.4	0.1	0.5
Rh	260	24	5.0	2.6	2.0	0.4	0.6

Table 2： Reusability of Ru/MO_2 for decomposition of polyethylene

Usage time	Conversion (%)	Yield (%)			
		Gas (C1-C4)	Liquid fuel (C5-C21)	Heavy oil (C22-C45)	Lubricating oil (C15-C45)
1st	100	9.3	77.8	12.9	36.4
…	…	…	…	…	…
3th	100	12.6	81.0	6.4	32.5
…	…	…	…	…	…
5th	100	11.7	78.8	9.5	41.4

* MO_2: Metal oxide supporter

Patent Data Sheet

Application No.(Serial No.): JP2019-090122 (T18-284)

Inventor: TAMURA Masazumi, TOMISHIGE Keiichi, NAKAGAWA Yoshinao

Contact

Tohoku Techno Arch Co., LTD
TEL:+81-22-222-3049, FAX:+81-22-222-3419
Click to contact