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EFFECTS OF PROMOTERS ON BIOMASS GASIFICATION USING NICKEL/DOLOMITE CATALYST

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ภัทรกร ชัยประเสริฐ : ผลของตัวส่งเสริมต่อแกซีฟิเคชันชีวมวล โดยใช้ตัวเร่งปฏิกิริยานิกเกิล/โดโลไมต์
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งานวิจัยนี้ได้ศึกษาการเตรียมตัวเร่งปฏิกิริยานิกเกิลบนตัวรองรับโดโลไมต์ โดยศึกษาประสิทธิภาพในการเร่งปฏิกิริยาแกซีฟิเคชันด้วยไอน้ำ เพื่อผลิตแก๊สสังเคราะห์จากชีวมวล 2 ชนิดคือกะลามะพร้าวและกะลาปาล์ม โดยศึกษาผลของตัวแปรต่างๆ ได้แก่ อุณหภูมิการเผา อุณหภูมิปฏิกิริยา อัตราส่วนต่อคาร์บอน อัตราการป้อน ออกซิเจน และผลของตัวส่งเสริม เพื่อผลิตแก๊สผลิตภัณฑ์ที่มีปริมาณสูง จากผลการทดลองตัวเร่งปฏิกิริยานิกเกิล/โดโลไมต์ จะช่วยเร่งปฏิกิริยาฟอรัมมิงและการแตกตัวของทาร์ได้อย่างมีประสิทธิภาพ ที่อุณหภูมิ 800 องศาเซลเซียส อัตราส่วนไอน้ำต่อคาร์บอน 0.95 ได้ปริมาณแก๊สผลิตภัณฑ์สูง และปริมาณทาร์ลดลงโดยร้อยละ การเปลี่ยนเป็นแก๊สผลิตภัณฑ์ของกะลามะพร้าวและกะลาปาล์มคือ 81.25 และ 78 ตามลำดับ

นอกจากนี้ยังได้ศึกษาผลของตัวส่งเสริมต่อแกซีฟิเคชันชีวมวลโดยใช้ตัวเร่งปฏิกิริยานิกเกิล/โดโลไมต์ ซึ่งได้แก่แพททินัม โคบอลต์ และเหล็กโดยศึกษาผลของปัจจัยต่างๆดังนี้ ผลของการเตรียมตัวเร่งปฏิกิริยาวิธีการเคลือบฝังและการตกตะกอนร่วม พบว่าวิธีการเคลือบฝังจะให้สมบัติของตัวเร่งปฏิกิริยาดีกว่าโดยวิธีการการตกตะกอนร่วม นอกจากนี้พบว่าตัวส่งเสริมมีผลต่อปฏิกิริยาต่างๆในแกซีฟิเคชันที่แตกต่างกันโดย แพททินัมสามารถเร่งปฏิกิริยาฟอรัมมิง เหล็กเร่งปฏิกิริยาซิฟท์ได้ดี และโคบอลต์เร่งปฏิกิริยามีเทนเนชัน นอกจากนี้ยังพบว่าการเติมโลหะเป็นตัวส่งเสริมจะช่วยลดการเกาะติดคาร์บอนได้โดยแพททินัมลดการเกาะติดคาร์บอนบนนิกเกิล/โดโลไมต์ได้มากที่สุด

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This research studied the preparation of Ni catalyst on dolomite support. The performance of an addition of catalyst was evaluated on the steam gasification of coconut shell and palm shell to produce syngas. The effects of parameters, such as calcination temperature, reaction temperature, steam per carbon (S/C) ratio, oxygen flow rate, and types of promoters, were investigated with the purpose of optimizing the gaseous products. The experimental works showed that Ni/Dolomite catalyst efficiently enhanced the reforming reaction and tar cracking. Furthermore, it was found that gaseous products were highly produced at temperature of 800 °C and (S/C) ratio of 0.95. At this condition, small amount of tar was found. Carbon conversion to gaseous products of coconut shell and palm shell were 81.25% and 78%, respectively.

The effects of the types of promoters, such as Platinum, Cobalt, and Iron, on biomass gasification were also evaluated. The areas of interest were the effects of preparation methods which were impregnation and coprecipitation. It was found that catalyst preparation by impregnation method gave superior performance. The conclusion can be drawn from the experiments that platinum promoter enhanced reforming reaction, iron promoted water gas shift reaction, and cobalt promoter favored methanation reaction. The addition of noble metal reduced carbon deposition on Ni/Dolomite.

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