late conversion and coke content on the catalyst in the catalytic cracking.

Calculations of the temperature effect of regenerated catalyst on the catalytic cracking performance carried out using by mathematical model of the catalytic cracking [2]. Catalyst temperature after regeneration stage varied in the range of (630–720) °C.

The process temperature increases from 486 to 539 °C and the degree of conversion of the catalytic cracking feedstock increases from 44 to 90% wt. (fig. 1) with increasing the temperature of regenerated catalyst in the range of 630–720 °C. In this case initially increases gasoline yield (to the temperature of regenerated catalyst 710 °C), then observed the decrease of gasoline yield (is a "re-cracking" process) and increasing of gas product yield from 4.05 % wt. (process temperature 486 °C) to 25.6 % wt. (at 539 °C). The maximum theoretical yield of gasoline is 59.9 % wt. However, the rate of coke formation reactions and the content of coke on the catalyst increases from 0.44 to 0.88% by weight.

Thus, the products yield from the catalytic cracking unit depends largely on the temperature of regenerated catalyst. Increasing the catalyst temperature after regenerator from 630 to 720 °C at a constant ratio of catalyst:feedstock 5.56 provides the increase of process temperature from 486 to 539 °C, the degree of conversion increase more than 40% and coke content on the catalyst at 0.44% wt. In this case, the gasoline fraction yield passes through a maximum (59.9 % wt.). The optimization of process conditions depending on the temperature of the regenerated catalyst and the feedstock composition is important to obtain the maximum yield of gasoline fraction and a low content of coke on the catalyst.

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EFFECT OF RADIATION ON CHARACTERISTICS OF EPOXY POLYMER

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Today, many fields of human activity can produce radioactive wastes. Because of the nature of this kind of waste, it needs proper management and treatment methods in order to protect human health and environment, not only for current time, but also in the future generation.

There are many ways to immobilize radioactive wastes, they depends on the nature of the wastes (its radioactivity, forms), final disposal facility conditions, technology and budget available [1]. In general, based on the matrix materials, we can divide radioactive waste mobilization methods to several groups:

- Cementation: cement is an inorganic material that has the ability to react with water at ambient conditions to form a hardened mass. Cement are usually utilized to conditioning large amount of low level radioactive waste because its availability and reasonable cost. However, cementation is poorly incorporated with organic-based liquid wastes.
- Bituminization: bitumen is a thermoplastic material and contains a mixture of high molecular weight, which obtained as a residue in petroleum or coal tar refining. Unlike cement, bitumen could be used to immobilize organic wastes such as waste oil. As a high molecular hydrocarbon, bitumen is expected to withstand well against environmental conditions.
- Vitrification: this method designed to immobilize waste for a long time in compact solid, insoluble form by combining solid waste with glass-forming material like borosilicates, and then heating the mixture under high

Table 1. Tensile properties of epoxy polymer

Dose, kGy	Tensile strength, MPa	Elongation at break, %	Young's modulus, MPa
0	51.1±3	10.55±0.8	4.84
30	56.8±4	10.24±0.6	5.55
100	58.8±5	10.04±0.8	5.86
300	42.6±6	7.98±0.3	5.34

temperature to form glass-like solid form [2]. This method can be used to treat high level radioactive wastes. However, this method is very costly and can be applied for small scale facilities.

- Polymerization: polymers can be used for immobilizing radioactive waste, which cannot be treated by previously mentioned methods. Polymers have high compressive strength, considerable chemical resistance property against many kinds of corrosive elements appeared in the waste. The inherent resistance of polymers also means they have better control over leaching and stand firm against adverse environmental effect [1].

Epoxy resins are thermosetting polymers, which have cross-link polymer chain to form the solid form when adding curing elements. Compared to thermoplastic, thermosetting polymers with cross linked polymer chain usually have better mechanical and chemical properties, as well as thermal stability. Moreover, when undergoing forming procedure, thermosetting polymers can take other substances' molecules in to their molecular network and have tightly fixed them there, thus effectively immobilize radionuclides when treating radioactive wastes.

The epoxy-diane resin ED-20 is widely used in engineering due to high mechanical properties, good adhesion, temperature and chemical resistance. It is of interest to use the epoxy resin ED-20 for immobilization of radioactive wastes. However, it is known that polymers are usually brittle and prone to cracking under the radiation action. In this work, the effect of electron beam irradiation on the mechanical properties of epoxy polymer was studied.

The epoxy polymer samples were prepared using ED-20 and polyethylenepolyamine as a hardener. The irradiation of the samples was carried out with an electron beam of doses 30, 100 and 300 kGy. The tensile properties of the samples were analyzed using a H50KT (Tinius Olsen) Universal Testing Machine, a load cell was 1000 N.

The tensile properties, including tensile strength, elongation at break, and Young's modulus of the epoxy samples after irradiation are summarized in Table 1.

As followed from Table 1, the tensile strength increases after irradiation with dose of 100 kGy by 15%, then decreases and after dose of 300 kGy is 83% of the initial value. A similar dependence is obtained for the Young's modulus of the epoxy polymer.

Thus, the obtained results showed that the mechanical characteristics of the epoxy resin are increased by the action of electron beam to a dose of 100 kGy. Epoxy resin is a polymer with high resistance to radiation and can be used to immobilize radioactive wastes.

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