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Kesetimbangan fase padat-cair poliakrilamid dalam pelarut air-metanol
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INTISARI

Kesetimbangan fase berperan dalam hal perancangan suatu proses pembuatan polimer. Salah satu hal penting dalam operasi pemurnian dan produksi polimer adalah pengetahuan tentang perilaku fase dari larutan polimer/pelarut. Tetapi kemampuan memperkirakan sifat campuran suatu larutan sangat terbatas, terutama untuk sistem terner satu polimer dalam dua pelarut. Beberapa model koefisien aktifitas dicoba diterapkan untuk memperkirakan kesetimbangan fase padat-cair poliakrilamid dalam pelarut air-metanol, yaitu model Flory, model *modified*-UNIFAC dan UNIFAC-Free Volume. Penelitian ini bertujuan untuk menentukan model koefisien aktifitas yang paling cocok diantara ketiga model tersebut.

Percobaan dilakukan dalam labu leher tiga yang dilengkapi pendingin balik, pengaduk merkuri dan penangas air. Campuran air dan metanol sebanyak 30 mL dengan perbandingan tertentu diaduk sambil dipanaskan. Setelah suhu tertentu yang diinginkan tercapai, 4 gram poliakrilamid dimasukkan. Suhu dijaga tetap konstan. Setelah keadaan setimbang tercapai, pengadukan dihentikan. Sebanyak 5 mL larutan diambil, ditimbang dalam gelas arloji dan diuapkan dalam eksikator hampa. Padatan yang tertinggal ditimbang kembali untuk dihitung fraksi mol poliakrilamid dalam larutan. Pengukuran berat molekul poliakrilamid menggunakan viskosimeter Ostwald. Variabel yang diteliti adalah pengaruh suhu dan komposisi larutan campuran.

Hasil penelitian menunjukkan bahwa model Flory (II) memberikan hasil yang lebih baik daripada model *modified*-UNIFAC dan model UNIFAC-Free Volume. Penyimpangan model Flory (II) sebesar 6,32%; model *modified*-UNIFAC sebesar 15,65% dan model UNIFAC-Free Volume sebesar 87,18%. Model *modified*-UNIFAC mampu memperbaiki model UNIFAC asli dengan memasukkan satu *adjustable parameter* P sebesar 0,7594.

Kata kunci: kesetimbangan fase, sistem terner, poliakrilamid, model Flory, model UNIFAC

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ABSTRACT

Phase equilibrium has a crucial role in the polymer processes, such as phase behaviour of polymer/solvent solution. Unfortunately, the prediction method of such mixtures properties were still rather limited, specially for ternary system with one polymer in biner solvent. Several activity coefficient models were used to predict the solid-liquid equilibrium (SLE) for polyacrylamide in water-methanol system. The models are Flory, modified-UNIFAC and UNIFAC-Free Volume. The aim of this research is to find out most appropriate model for this system.

Experiment was carried out in a three-necked boiling flask with a reflux condenser, mercury strirer and water bath. Around 30 mL of water and methanol mixtures with certain ratio was stirred and heated at desired temperature. After the temperature had been achieved, 4 grams of polyacrylamide was added. Liquid sample (about 5 mL) was taken after an equilibrium condition reached and then dried in a vacuum exicator. The remaining solid in the sample was weighed to determine the mole fraction of polyacrylamide in the solution. The molecular weight of polyacrylamide was measured by viscometer Ostwald. Variables studied were temperature and composition of mixed solvent.

The results showed that Flory (II) model was better than modified-UNIFAC and UNIFAC-Free Volume. Flory (II) model gave 6.32% of error; modified-UNIFAC model gave 15.65% of error and UNIFAC-Free Volume model gave 87.18% of error. Modified-UNIFAC model could improve UNIFAC original model with one adjustable parameter P = 0.7594.

Keywords: Phase equilibria, ternary system, polyacrylamide, Flory model, UNIFAC model