Abstract

Ethanol blending with petrol is an alternative source of green energy but ethanol is so hydrophilic that it can absorb water from its surroundings thus causing phase separations on the blend. In this research, the effects of sonication on six heterogeneous blend ratios containing ethanol, petrol and water were evaluated and their stabilities at different temperatures 15ºC, 25ºC, and 35ºC respectively. The more ethanol content in the solution, the less the amount of energy obtained per liter of the solution. A sonicator was set at different amplitudes in order to investigate the effects of the amount of sound energy on the homogenizing the solutions. It was found that the greater the amplitude, the less time needed to achieve a homogeneous solution and the greater the temperature gradient. However, the time needed to achieve this was different depending on the solution compositions. Before storage, all the samples were sonicated using amplitude of 40% and a cycle of 1. Another observation that was made is different solution temperatures upon forming a homogeneous solution and the final temperature after 6 minutes of sonication at 40% amplitude. The higher the temperature gradient generated by sonication, the faster it takes to reach a homogeneous solution. The homogeneous solutions after sonication were stored under the temperatures mentioned above. At 15ºC, it was found that all the samples formed two phases, thus further investigation is needed for better conclusion of enhancement of the blending process at 15 ^{0}C using sonication. At 25ºC, the three components' formed heterogeneous mixture; which means that as one moves away from the phase boundary into the cloudy phase, it becomes more difficult to sonicated a sample to form a stable homogeneous solution. Generally, the greater the storage temperature, the more stable the solution will be. Ethanol composition was also measured on the samples that had complete phase separations in order to compare ethanol distribution values between the sonicated samples and the ones which were just stirred with the mixtures being of the same composition. Sonicated samples show a change in the phase equilibrium values, that is, different ethanol distribution values between the water and petrol phases. It was found that ethanol retention in the petrol phase was greater for the sonicated samples as compared to the stirred ones and this was true for up to 60days of storage. However, ethanol concentration in the petrol phase seemed to be approaching the stirred solution equilibrium as the 30day ethanol concentration was greater than the 60day one. The phase diagram can be altered using ultrasound and whenever a phase change has occurred, a corresponding phase diagram results.