Dehydration of IPA-Water Binary System With LiBr (Salt) as Solvent

Parimal Patel, Kunjan Patel

Vishwakarma Government Engineering College, Ahmedabad

Background & Description:

Isopropyl alcohol is a very useful solvent for many industries and it requires in pure form for specific applications. It makes an azeotrope with water at 80.3°C having composition of 87.4% by weight. IPA recovery is becoming a major issue in the pharmaceutical and chemical industries. Solvent recovery by conventional batch distillation is limited by the frequent presence of azeotrope in the used solvent mixtures. It is seen that conventionally methods used are not much effective or large energy consuming. Another alternative is to add salt which is helpful in changing the relative volatility of the mixture and separation gets is much easier. In this process we used Lithium Bromide salt in isopropanol -water binary azeotropic mixture using extractive distillation. As LiBr is a high boiling point salt, it will not appear in the distillate and moreover LiBr is hygroscopic and has a characteristic to give higher boiling point elevation with water which is main cause of its use in this application.

Process Description:

As, you can see, Azeotropic mixture of IPA-Water mixture has fed into first distillation column with stream S-01 and stream S-02 contains LiBr (salt) as solvent has fed into first column. Stream S-04 contains pure IPA. Stream S-05 has fed into second distillation column for further purity. Stream S-06 is passed for recycling process and stream S-07 has fed into compound separator for removal of LiBr (salt) and stream S-08 contains pure water. Stream S-09 is further recycled for LiBr (salt).
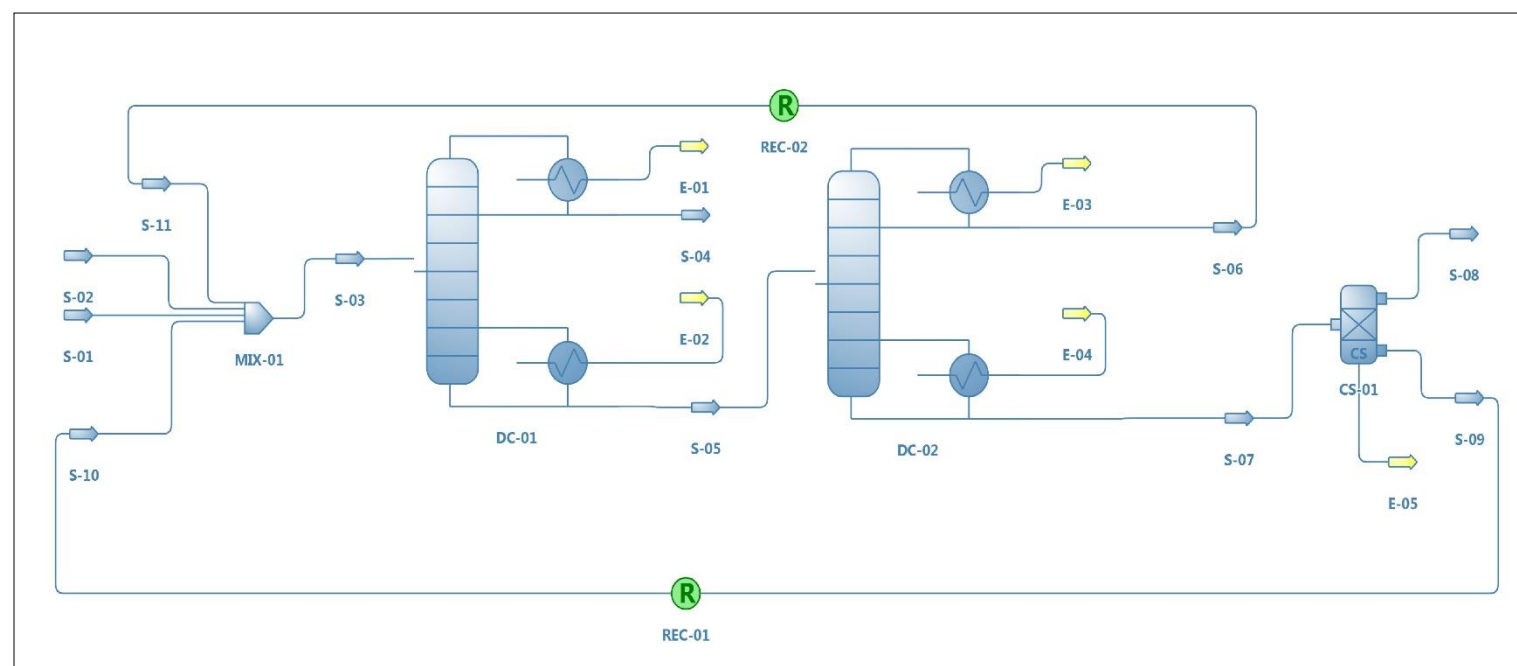
Results:

Streams	Temperature	Mass Flow	Molar Flow	Molar Fraction (Mixture) / Isopropanol	Molar Fraction (Mixture) / Water	Molar Fraction (Mixture) / Lithium Bromide
S-01	359.032	5.77888	118.179	0.73394	0.26606	2.2E-181
S-02	820.15	0.603197	6.94528	0	0	1
S-03	820.15	0.603197	6.94528	0	0	1
S-04	373.789	4.94583	272.888	0.002163	0.99758	0.000257
S-05	373.789	5.54902	279.834	0.002109	0.972821	0.02507
S-06	359.032	5.77888	118.179	0.73394	0.26606	2.2E-181
S-07	361.891	11.3279	398.013	0.219407	0.762967	0.017626
S-08	355.57	34.5118	577.108	0.993021	0.006979	2.4E-112
S-09	355.998	45.8398	975.121	0.677256	0.315549	0.007194
S-10	298.15	0.008	0.092113	0	0	1
S-11	355.55	39.4657	850	0.675264	0.324736	0
Units	K	kg/s	mol/s			

Table 1: Streamwise Results for the Recovery of Dehydration of IPA-Water Binary System With LiBr (Salt) as Solvent Flowsheet

References:

Research Paper   : http://ijset.com/publication/v2/039.pdf

VLE Data   : http://vle-calc.com/