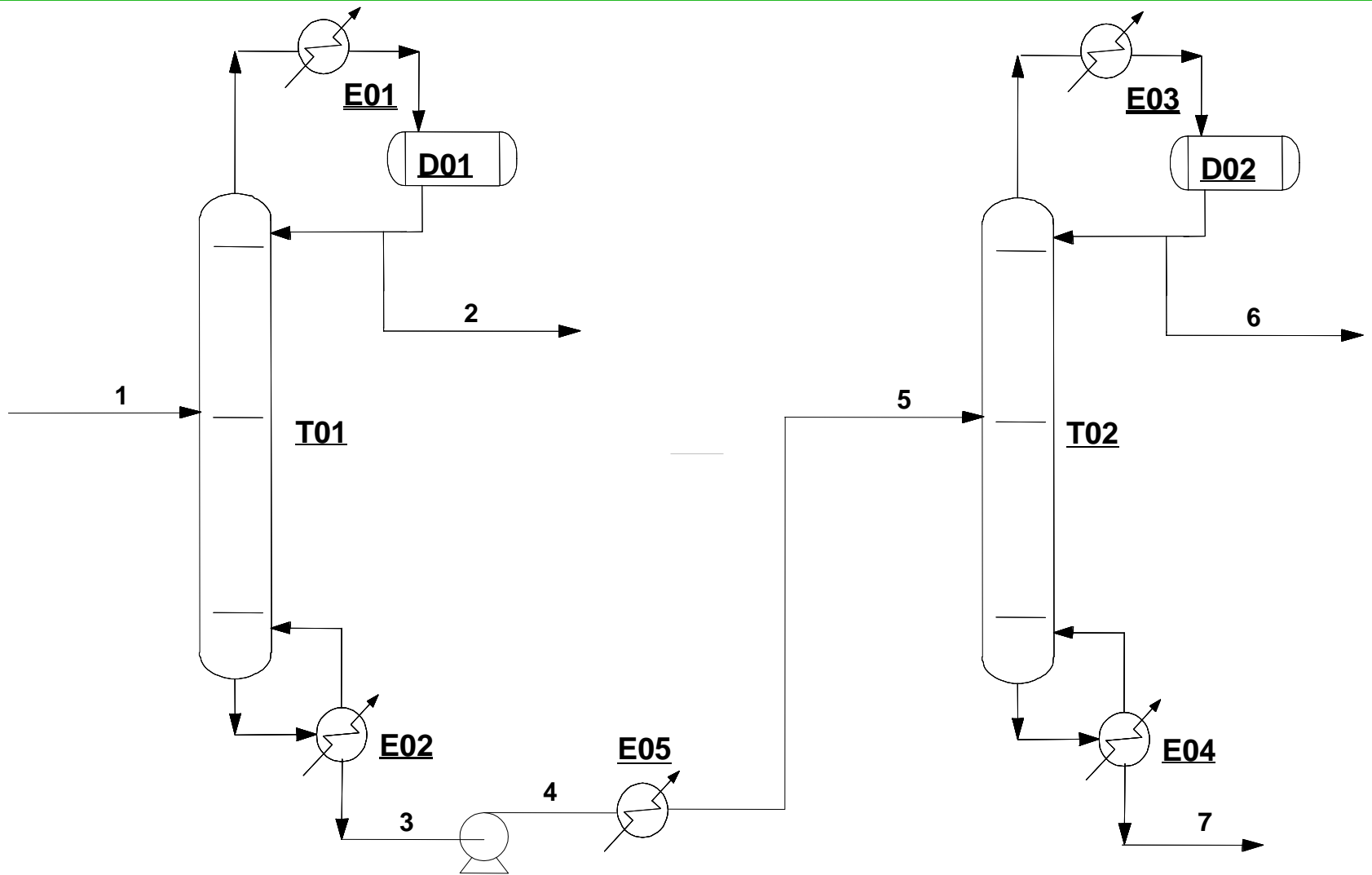
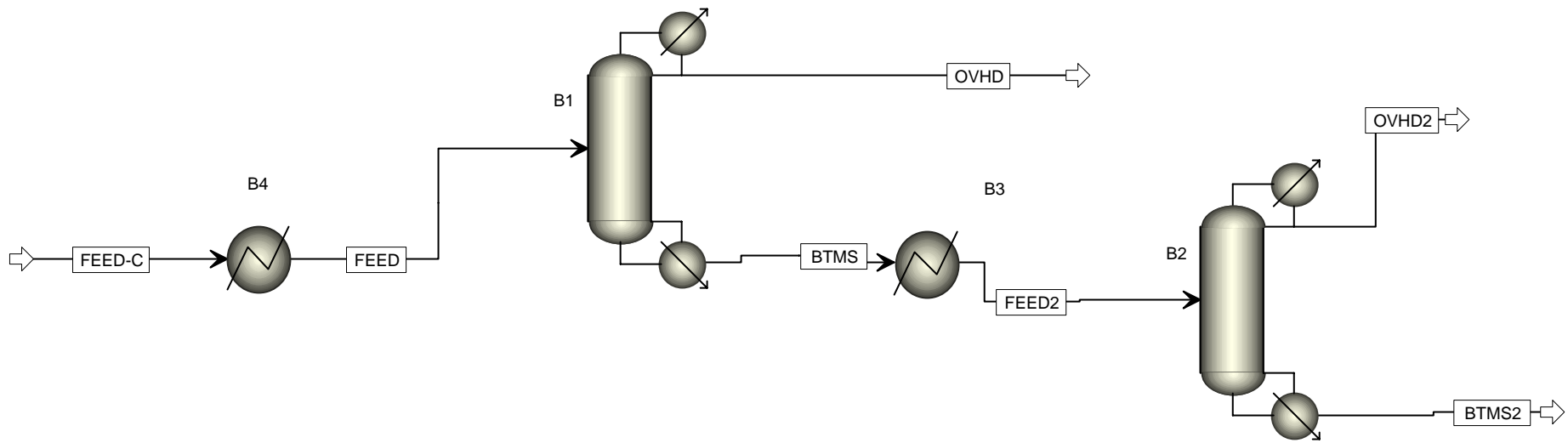

H₃PO₄ Recovery Unit Simulation from Waste Acid Mixtures Using Aspen Plus Electrolyte Module

Dr. Jungho Cho, Professor
Department of Chemical Engineering
Dong Yang University

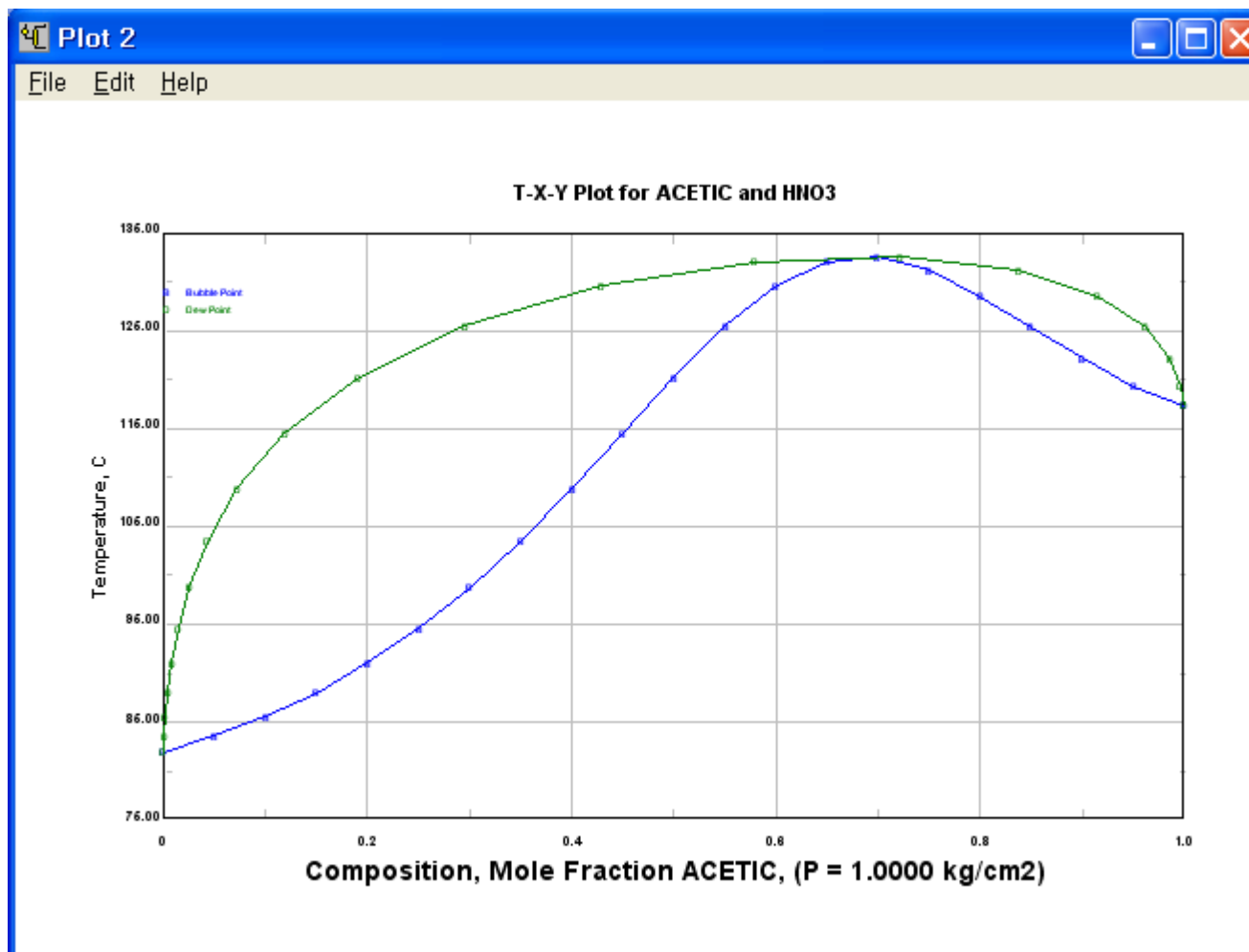
Process Flowsheet for Phosphoric Acid Recovery Process



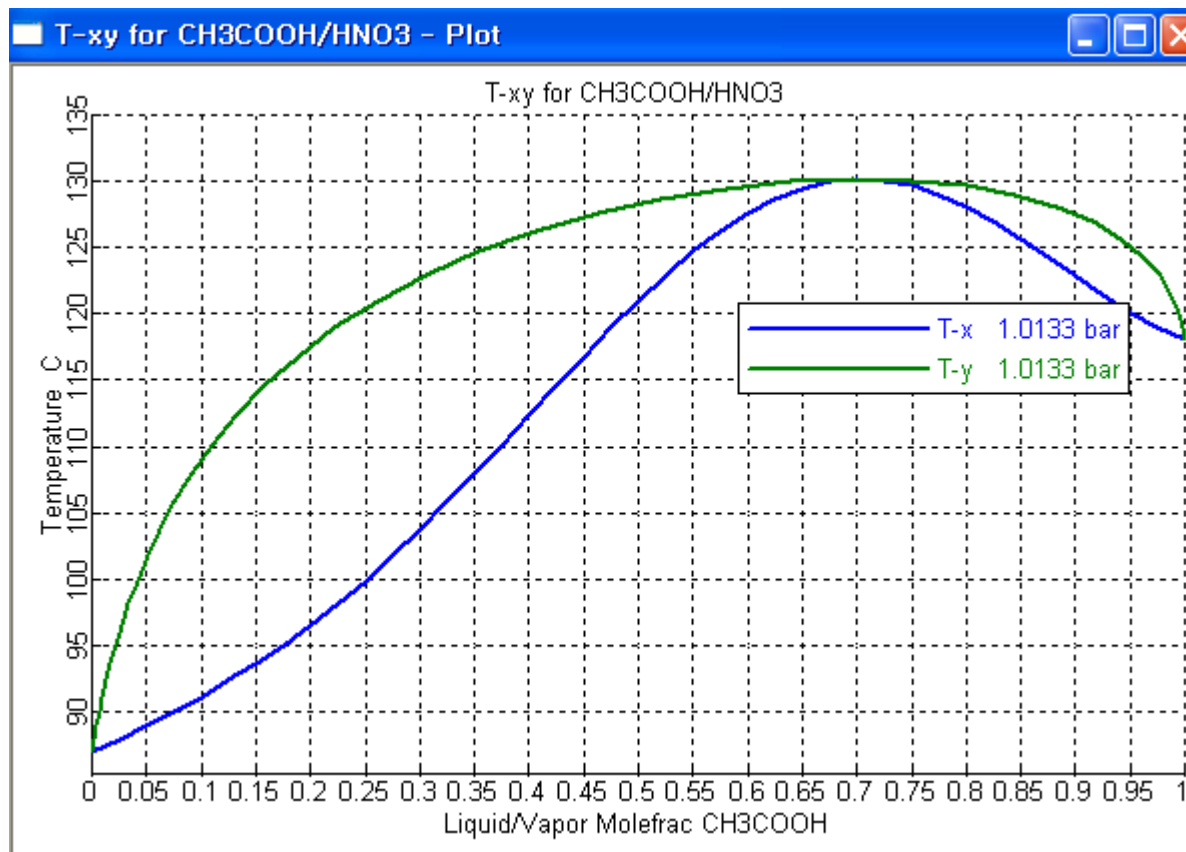
Process Flowsheet for Phosphoric Acid Recovery Process



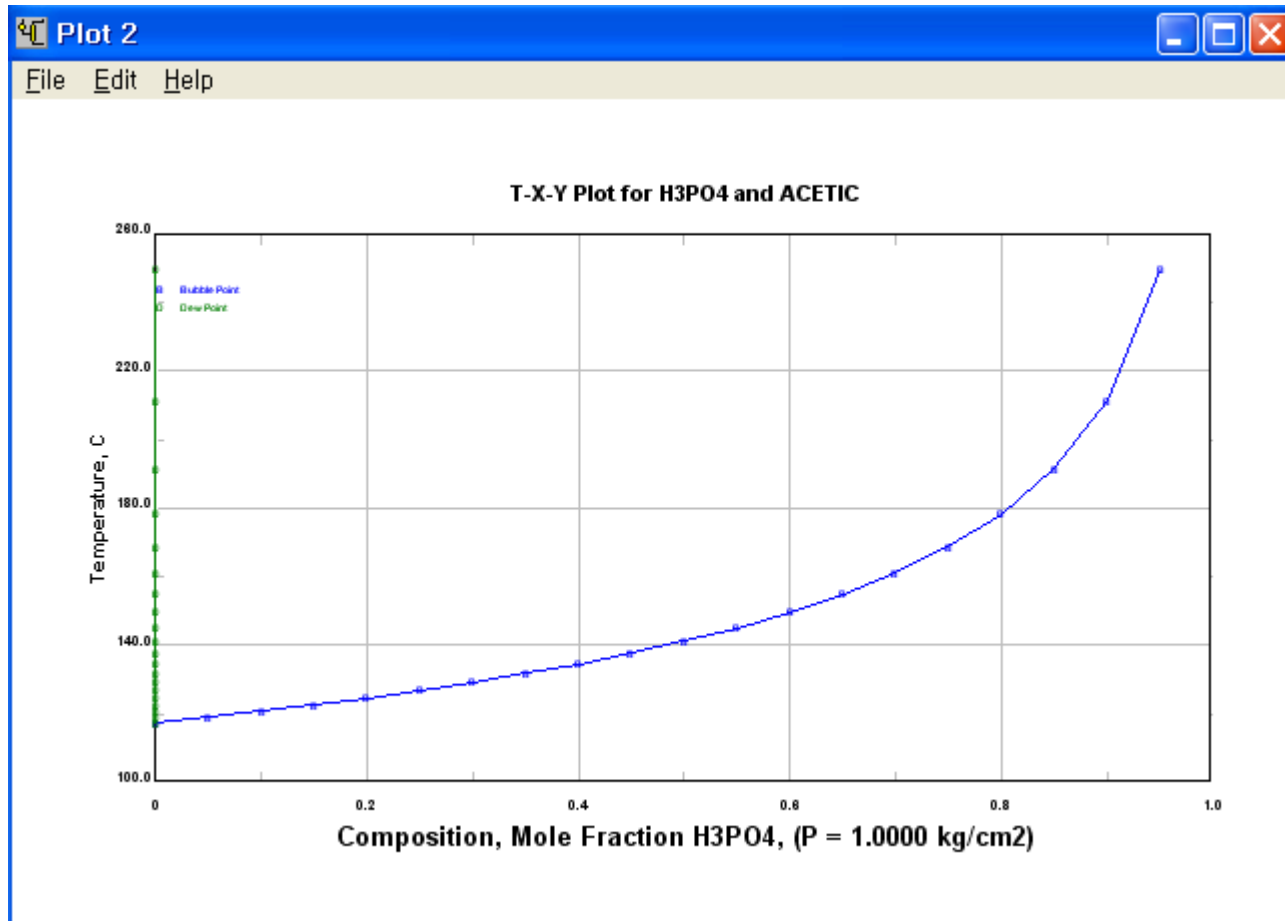
Phase Diagram for CH₃COOH + HNO₃



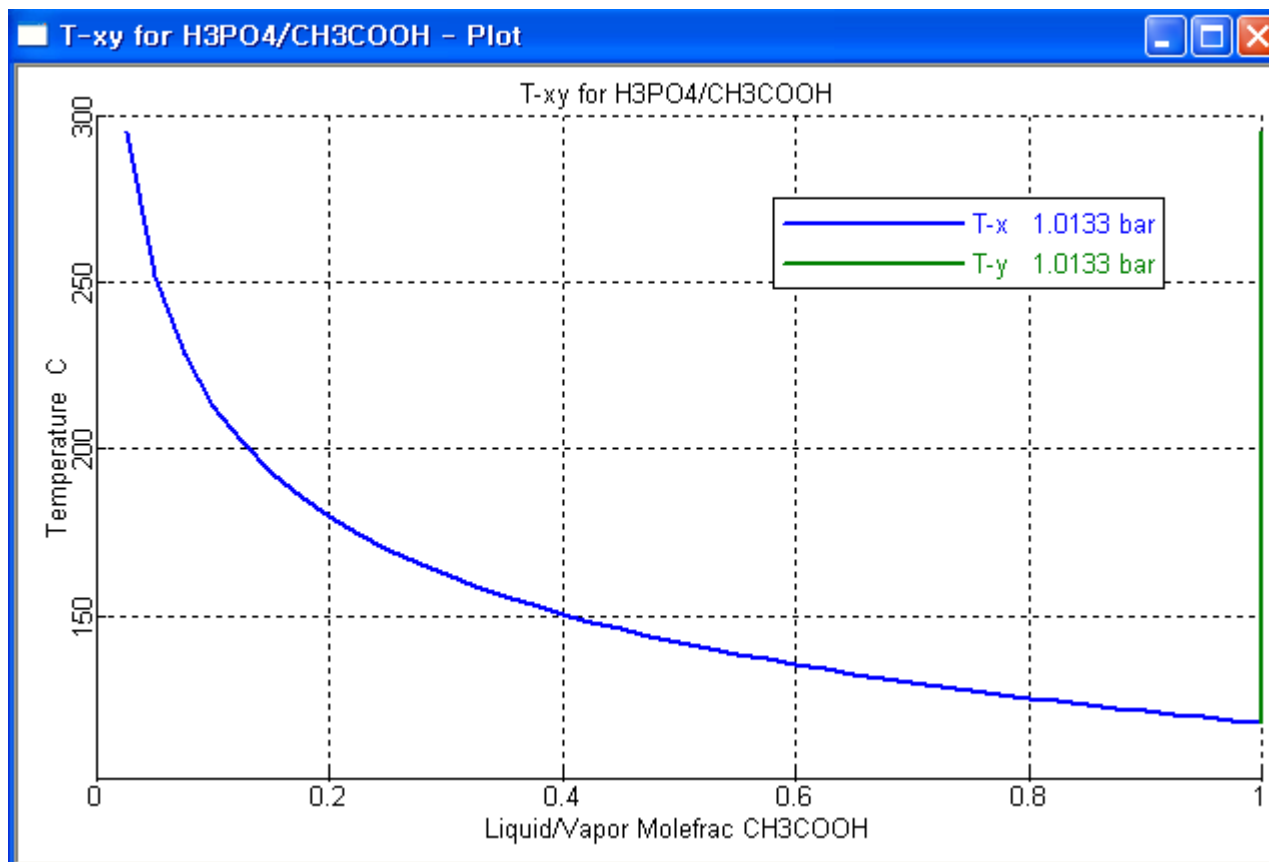
Phase Diagram for CH₃COOH + HNO₃



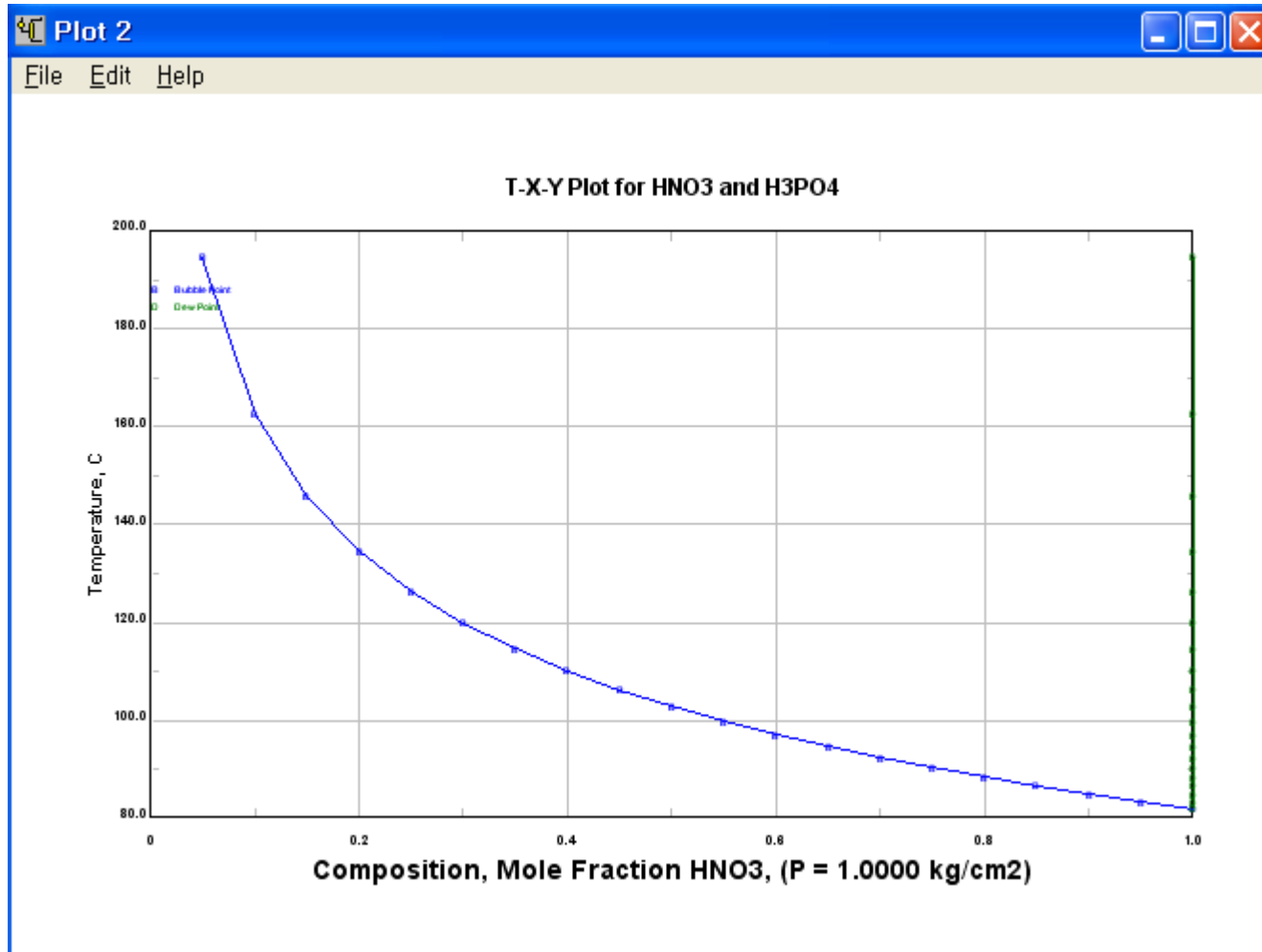
Phase Diagram for H₃PO₄ + CH₃COOH



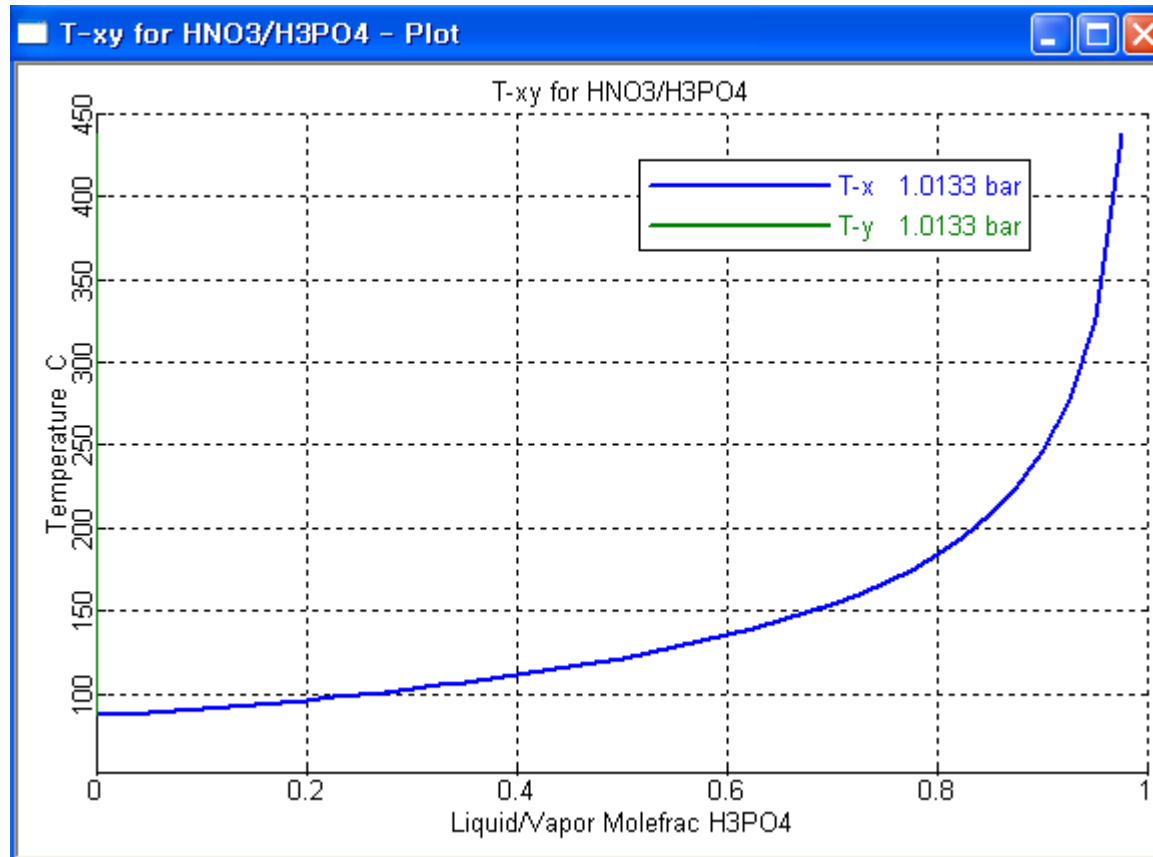
Phase Diagram for H₃PO₄ + CH₃COOH



Phase Diagram for HNO₃ + H₃PO₄



Phase Diagram for HNO₃ + H₃PO₄



Description for Phosphoric Acid Recovery Process

Unit	Description
T01	Nitric Acid Recovery Column
T02	Phosphoric Acid Recovery Column
E01	Nitric Acid Recovery Column OVHD Condenser
E02	Nitric Acid Recovery Column BTMS Reboiler
E03	Phosphoric Acid Recovery Column OVHD Condenser
E04	Phosphoric Acid Recovery Column BTMS Reboiler
E05	Feedstock Pre-cooler to Phosphoric Acid Recovery Column
D01	Nitric Acid Recovery Column OVHD Reflux Drum
D02	Phosphoric Acid Recovery Column OVHD Condenser
Stream	Description
1	Waste Acid Crude Feed
2	Nitric Acid Product
3	Nitric Acid Recovery Column BTMS Stream
4	Boosted Nitric Acid Recovery Column BTMS Stream
5	Feed to Phosphoric Acid Recovery Column
6	Acetic Acid Product
7	Phosphoric Acid Product

Feedstock Characterization

Feedstock Characterization		
Flow, Kg/hr	3,425	
	Flowrate (Kg/hr)	Weight Percent
Nitric Acid	171.25	5.00
Acetic Acid	342.50	10.00
Phosphoric Acid	2,911.25	85.00
Temperature (°C)	35.00	
Pressure (bar)	2.50	

Product Specification

- Final target of the phosphoric acid recovery process is to obtain a purified phosphoric acid as a bottom product at second column by removing nitric acid and acetic acid at each column top products

Mass Balance for Phosphoric Acid Recovery Process

	1	2	3	4	6	7
	Waste Acid Crude Feed	Nitric Acid Product	Nitric Acid Recovery Column BTMS Stream	Boosted Nitric Acid Recovery Column BTMS Stream	Acetic Acid Product	Phosphoric Acid Product
Flow, Kg/hr	3,425.00	461.485	2,963.515	2,963.515	46.522	2,916.983
Nitric Acid	171.25	154.125	17.125	17.125	14.208	2.917
Acetic Acid	342.50	307.360	35.140	35.140	32.324	2.816
Phosphoric Acid	2,911.25	0.000	2,911.25	2,911.25	Trace	2,911.25
Temp. (°C)	100.00	77.000	223.7	100.000	78.500	397.900

The End...