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APPENDIX

Table A-1 Composition of dried natural gas obtained from the Petroleum Authority of Thailand (PTT).

Composition	Molecular Weight	% Vol
Methane	16	67.82
Ethane	30	13.27
Propane	44	11.80
iso-Butane	58	4.20
n-Butane	58	2.91

Capillary Condensation

Kelvin's equation (Gregg and Sing, 1982)

$$\ln \frac{P}{P_o} = \frac{-2\gamma V_m \cos\Theta}{RTr_m}$$

where

P/P_o	=	relative pressure of vapor at equilibrium
γ	=	surface tension of the liquid adsorbed
V_m	=	molar volume of the liquid adsorbed
θ	=	contact angel
R	=	gas constant (8.314 J/mol K)
T	=	adsorption temperature (303 K)
r_m	=	pore radius of adsorbent (5.98 angstrom)

For capillary condensation, $\cos\theta = 1$

For Water

Surface tension	=	71.2	mN/m
Molar volume	=	1.80533×10^{-5}	m^3/mole

Substituted all data, obtained

P/P_O = 0.82

Multiplied by vapor pressure of water at 303 K (0.042 atm), obtained

$P/P_{O\ 303K}$ = 0.008

So for this alumina, the capillary condensation of water in the pores will start at composition of water in the gas phase equal to 0.8% vol.

For Pentane

Surface tension	=	14.9	mN/m
Molar volume	=	1.16967×10^{-4}	m^3/mole

Substituted all data, obtained

$$P/P_o = 0.098$$

Multiplied by vapor pressure of pentane at 303 K, obtained

$$P/P_{o\ 303K} = 0.079$$

So for this alumina, the capillary condensation of pentane in the pores will start at composition of pentane in the gas phase equal to 7.9% vol.

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