

PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Because of their similar structure, the three xylenes and the isomeric ethyl benzene exhibit similar properties. The distillation characteristics of the C₈ aromatic compounds are of considerable importance.

o-xylene is more readily separated from m-xylene because of a 5°C difference in boiling point. The difference in freezing point between the p-xylene and other C₈ aromatic compounds is utilized for p-xylene separation. The critical compression ratios are 14.2, 13.6, and 9.6 for p-xylene, m-xylene and o-xylene respectively.

The research octane values are 113, 116.4, 117.5 and 107.4 for Ethyl benzene, p-xylene, m-xylene and o-xylene respectively.

The physical properties of these for compounds are summarized as follows:

Property	p-xylene	m-xylene	o-xylene	Ethyl benzene
Molecular weight	106.167	106.167	106.167	106.167
Density @ 25°C, g/cm ³	0.8610	0.8642	0.8802	0.8671
Boiling point °C	138.37	139.12	144.41	136.19
Freezing point °C	13.263	-47.872	-25.182	-94.975
Refractive	1.4958	1.4971	1.5054	1.4959

index @25°C				
Surface tension mN/m	28.27	31.23	32.5	31.50
Dielectric constant @25°C	2.27	2.367	2.568	2.412
Dipole moment of liquid, C-m	0.0	0.30	0.51	0.36
Critical Properties				
Critical density, mmol/cm ³	2.64	2.66	2.71	2.67
Critical vol cm ³ /mol	379.0	376.0	369.0	374.0
Critical pressure Mpa	3.511	3.535	3.730	3.701
Critical temperature °C	343.05	343.90	357.15	343.05
Thermodynamic Properties				
C _s @25°C, J/(mol. K)	181.66	183.44	180.7	185.96
S _s @25°C, J/(mol. K)	247.36	253.25	246.61	255.19
(H-H ₀) @ 25°C J/(mol. K)	44.641	40.616	42.382	40.219

$-(G_S-H_o/T) @$ 25 °C J/(mol. K)	97.633	117.03	104.46	120.29
Heat of transition				
Vaporization @ 25°C	42.036	42.036	43.413	42.226
Fusion	17.112	11.569	13.598	9.164
Formation @ 25°C	-24.43	-25.418	-24.439	-12.456
Entropy of formation	247.4	252.2	246.5	255.2
Vapor Pressure, Antoine Equation				
A	6.1155	6.1349	6.1239	6.0821
B	1453.4	1462.266	1474.679	1424.255
C	215.307	215.105	213.686	213.206

CHEMICAL PROPERTIES:

Reactions involving the position of the alkyl substituents:

These reactions include isomerization, disproportionation and dealkylation. Acids catalyze the interconversion of the three-xylene isomers. Xylenes isomerize to near equilibrium levels in a hydrogen fluoride – boron trifluoride system with low boron trifluoride concentrations. Isomerization at lower temperatures produces more p-xylene and o-xylene.