Table II. Characteristic Constant k_{12} for Binary Systems

$$\left[k_{12} = 1 - \frac{T_{c_{12}}}{(T_{c_{11}} T_{c_{22}})^{1/2}}\right]$$

System 1	System 2	$k_{12} \times 10^3$
Methane	Ethylene	1
	Ethane	1
	Propylene	2
	Propane	2
	n-Butane	4
	Isobutane	4
	n-Pentane	6
	Isopentane	6
	n-Hexane	8
	Cyclohexane	8
	n-Heptane	10
	n-Octane	(12)[a]
	Benzene	(8)
	Toluene	(8)
	Naphthalene	14
Ethylene (or ethane)	Ethane	0
	Propylene	0
	Propane	0
	n-Butane	1
	Isobutane	1
	n-Pentane	2
	Isopentane	2
	n-Hexane	3
	Cyclohexane	3
	n-Heptane	4
	n-Octane	(5)
	Benzene	3
	Toluene	(3)
	Naphthalene	8
Propylene (or propane)	Propane	0
	n-Butane	0
	Isobutane	0
	n-Pentane	1
	Isopentane	0
	n-Hexane	(1)
	Cyclohexane	(1)
	n-Heptane	(2)
	n-Octane	(3)
	Benzene	2
	Toluene	(2)
n-Butane (or isobutane)	Isobutane	0
	n-Pentane	0
	Isopentane	0
	n-Hexane	0
	Cyclohexane	0
	n-Heptane	0
	n-Octane	(1)
	Benzene	(1)
	Toluene	(1)
n-Pentane (or isopentane)	Isopentane	0
	n-Hexane	0
	Cyclohexane	0
	n-Heptane	0
	n-Octane	0
	Benzene	(1)
	Toluene	(1)
n-Hexane (or cyclohexane)	*n*-Heptane	0
	n-Octane	0
	Benzene	(1)
	Toluene	1
n-Heptane	*n*-Octane	0
	Benzene	(1)
	Toluene	(1)
n-Octane	Benzene	(1)
	Toluene	(1)
Benzene	Toluene	(0)
Carbon dioxide	Methane	(5 ± 2)
	Ethylene	6
	Ethane	8
	Propylene	10
	Propane	11 ± 1
	n-Butane	16 ± 2
	Isobutane	(16 ± 2)
	n-Pentane	(18 ± 2)
	Isopentane	(18 ± 2)
	Naphthalene	24
Hydrogen sulfide	Methane	5 ± 1
	Ethylene	(5 ± 1)
	Ethane	6
	Propylene	(7)
	Propane	8
	n-Butane	(9)
	Isobutane	(9)
	n-Pentane	11 ± 1
	Isopentane	(11 ± 1)
	Carbon dioxide	8
Acetylene	Methane	(5)
	Ethylene	6
	Ethane	8
	Propylene	7
	Propane	9
	n-Butane	(10)
	Isobutane	(10)
	n-Pentane	(11)
	Isopentane	(11)
Nitrogen	Methane	3
	Ethylene	4
	Ethane	5
	Propylene	(7)
	Propane	(9)
	n-Butane	12
	Helium	16
Argon	Methane	2
	Ethylene	3
	Ethane	3
	Oxygen	1
	Nitrogen	0
	Helium	5 ± 1
Tetrafluoromethane	Methane	7
	Nitrogen	2
	Helium	(16 ± 2)
Hydrogen	Methane	3
Neon	Methane	28
	Krypton	20 ± 2
Krypton	Methane	1

[a] *Numbers in parentheses are interpolated or estimated values.*

$$v_{c_{ij}}^{1/3} = \frac{1}{2}\left(v_{c_i}^{1/3} + v_{c_j}^{1/3}\right) \tag{14}$$

$$z_{c_{ij}} = 0.291 - 0.08\left(\frac{\omega_i + \omega_j}{2}\right) \tag{15}$$

$$T_{c_{ij}} = \sqrt{T_{c_i} T_{c_j}}(1 - k_{ij}) \tag{16}$$

The binary constant k_{ij} represents the deviation from the geometric mean for $T_{c_{ij}}$. It is a constant characteristic of the *i-j* interaction; to a good approximation, k_{ij} is independent of the temperature, density, and composition. In general, k_{ij} must be obtained from some experimental information about the binary interaction. Good sources of this information are provided by second virial cross coefficients (Prausnitz, and Gunn, 1958) or by saturated liquid volumes of binary systems (Chueh and Prausnitz, 1967b), Table II presents our best estimates of k_{ij} for 115 binary systems. As new experimental data become available, this table should be revised and enlarged.

The proposed mixing rule for a_{ij} differs from Redlich's original mixing rule in two respects: (1) introduction of a binary constant k_{ij}, and (2) combination of critical volumes and compressibility factors to obtain a_{ij} according to Equations 12 through 15. As a result of (2), the proposed mixing rule does not reduce to Redlich's original rule even when $k_{ij} = 0$, except when v_{c_i}/v_{c_j} is close to unity; in general,