TABLE II. Constants in viscosity-density power series fits ($\eta=a+b\rho+c\rho^2+\cdots$).

Gas	T (°C)	a (μP)	b (μP·cm³/g)	c (μP·cm⁶/g²)	d (μP·cm⁹/g³)	e (μP·cm¹²/g⁴)	σ (μP)
N_2	25	176.96±0.07	116.5±1.4	634±5			0.12
	−50	140.59±0.08	108.4±1.3	670±4			0.11
	−90	117.28±0.34	137.1±9.1	434±60	520±108		0.38
He	25	198.01±0.05	−41.1±9.8	2 175±393			0.06
	−50	162.82±0.07	−35.2±10.0	1 932±294			0.10
	−90	142.71±0.09	−46.2±11.0	2 835±261			0.11
H_2	25	88.55±0.03	144.8±12.3	7 693±985			0.04
	−50	72.93±0.06	98.2±18.1	10 531±1058			0.09
	−100	60.99±0.08	223.7±18.0	6 148±843			0.10
Ar	25	225.30±0.12	109.0±3.8	442±31	−249±70		0.11
	−50	175.27±0.08	101.5±0.9	367±2			0.14
	−100	138.04±0.58	86.6±10.7	357±52	−82±93	212±54	0.61

from Michels *et al.*[28] Agreement with our previous work[2] was excellent at 25°C and fairly good (the present data averaging slightly higher) at −50°C. Near 25°C, Kestin and Leidenfrost's[18] results are about 1% higher than ours, but the recent work of Kestin and Yata[29] is only about 0.5% higher, being thus in good agreement with Michels, Schipper, and Rintoul.[30] There is no other high-precision work in our lower-temperature range; Golubev and Shepeleva[31] and Rudenko and Slyusar[32] obtain results which increase with density somewhat more rapidly than ours or Michels'.

Argon

Argon[33] was also studied at 25, −50, and −100°C; the results are shown in Fig. 4. The densities were obtained from Michels, Wijker, and Wijker[34] at 25°C, and from Michels, Levelt, and de Graaff[35] at the lower temperatures. Agreement with our earlier work[1] is again fairly good. As before, at 25°C and moderate densities we are about 0.3% below Kestin *et al.*[13] and 0.2% above Michels, Botzen, and Schuurman.[36] Filippova and Ishkin's[21] low-temperature data deviate from ours in the same way as for N_2. Our −100°C isotherm requires special discussion, which must be postponed until the questions of density dependence have been considered.

[28] A. Michels, W. de Graaff, J. Wassenaar, J. M. H. Levelt, and P. Louwerse, Physica 25, 25 (1959).

[29] J. Kestin and J. Yata, J. Chem. Phys. 49, 4780 (1968).

[30] A. Michels, A. C. J. Schipper, and W. H. Rintoul, Physica 19, 1011 (1953).

[31] I. F. Golubev and R. I. Shepeleva, Gazov. Prom. 11, 54 (1966).

[32] N. S. Rudenko and V. P. Slyusar', Ukr. Fiz. Zh. (Russ. Ed.) 13, 917 (1968).

[33] Purity 99.998%, from Matheson Co.

[34] A. Michels, Hub. Wijker, and Hk. Wijker, Physica 15, 627 (1949).

[35] A. Michels, J. M. Levelt, and W. de Graaff, Physica 24, 659 (1958).

[36] A. Michels, A. Botzen, and W. Schuurman, Physica 20, 1141 (1954).

DENSITY DEPENDENCE OF VISCOSITIES

For each isotherm the viscosity was fitted to a least-squares power series in the density:

$$\eta=a+b\rho+c\rho^2+\cdots. \tag{1}$$

These fits were tried for polynomials of different degrees, the "best" fit (to *all* the points of the isotherm) being chosen by a variety of statistical tests[37]; the constants of the resulting series are listed in Table II. The standard deviations (σ) of the fits are in each case well under 0.2%, except for N_2 at −90°C and Ar at −100°C (for both of which the individual viscosities also have quite high deviations), thus confirming our estimate of precision (see below).

The "best" fits just described, however, do not

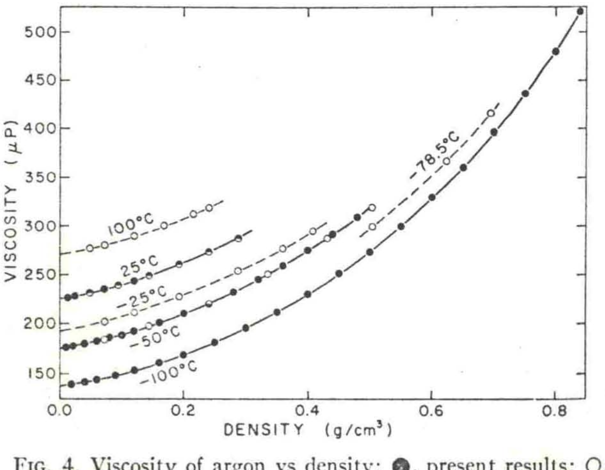

FIG. 4. Viscosity of argon vs density: ●, present results; ○, Flynn, Hanks, Lemaire, and Ross[1] (points nearly coinciding with present data indicated by ◑).

[37] A. Michels, J. C. Abels, C. A. ten Seldam, and W. de Graaff, Physica 26, 381 (1960); K. R. Hall and F. B. Canfield, *ibid.* 33, 481 (1967). See Ref. 10 for details of the application to the present data.