1 khz were higher than the dc conductivities. The difference between the two is quite substantial in the low-temperature region, between one-half to one order of magnitude. This difference diminishes with increasing temperature T. In the high-temperature region the difference is only 0.1–0.2 order of magnitude.

Peridotites and olivinites.—Because olivinites are usually described as a subgroup of peridotites (Hatch et al, 1952), results for the olivinites (no. 6013—Figure 1a and no. 6014) and the peridotites (no. 5375—Figure 1b and no. 6871) are presented together.

For sample no. 6013 only a very weak change of σ with pressure was observed. A decrease of σ was found with peridotite no. 6871. This sample exhibits quite an irregular dependence on temperature from about 500°C which gives rise to an uncertainty of the results above this T. An appreciable increase of conductivity with pressure was found in olivinite no. 6014, and peridotite no. 5375. The dependence of σ on P is better described by the pressure coefficient, which was calculated using linear extrapolation of $\log\sigma$ values as a function of P. Its values together with corresponding temperatures (T), and second derivatives $\Delta(\Delta\log\sigma/\Delta P)/\Delta T$, are given in Table 1.

From the graphs of $\log\sigma$ versus P, plots of $\log\sigma$ versus $1/T$ were constructed for two pressures, 0 and 20 kb, and are shown in Figure 2. Except for olivinite sample no. 6013, all the other plots represent averages of two measurements made on different samples cut off the same piece of rock. The electrical conductivity is, in different temperature intervals, represented by straight lines in the $\log\sigma$ versus $1/T$ plot, which suggests an exponential dependence of σ on $1/T$ of the form

$$\sigma = \sigma_0 \exp(-A/kT), \qquad (1)$$

where T is the absolute temperature, and k is Boltzmann's constant. A denotes an activation energy with $E^{(e)}/2 = A$, or $E^{(i)} = A$, depending on whether the conduction process is electronic ($E^{(e)}$), or ionic ($E^{(i)}$), respectively. Basically, σ_0 is proportional to the number of charge carriers per cubic centimeter. Values of A and σ_0 given in Table 1 show at least two distinctive temperature intervals, one of which is characterized by lower values of A in the range from about 0.6 to 1.4 eV, the other, beginning at temperatures 535–580°C,

Table 1. Characteristics of olivinites and peridotites.

Sample	T(°C)	A_{0kb}(eV) $(\log\sigma_0)_{0kb}$	T(°C)	A_{20kb}(eV) $(\log\sigma_0)_{20kb}$	$\Delta\log\sigma/\Delta P$ (kb^{-1})	T(°C)	$\Delta\log\sigma_0/\Delta P$ (kb^{-1})	$\Delta(\Delta\log\sigma/\Delta P)/\Delta T$ (kb^{-1} °K^{-1})
6013	300–535	0.83 −0.96	300–538	0.87 −0.65	-2.00×10^{-3} 3.10×10^{-3}	298 533	15.5×10^{-3}	2.2×10^{-5}
	535–600	2.33 8.33	538–600	2.35 8.47	0.85×10^{-3} 1.25×10^{-3}	540 596	7.0×10^{-3}	0.7×10^{-5}
6014	250–414	0.64 −3.37	250–406	0.69 −2.57	16.12×10^{-3} 21.50×10^{-3}	250 402	40.0×10^{-3}	3.5×10^{-5}
	414–538	1.38 1.96	406–520	1.16 0.94	28.75×10^{-3} 18.85×10^{-3}	412 514	-51.0×10^{-3}	-10.2×10^{-5}
	538–700	1.85 4.92	520–700	1.75 4.66	17.50×10^{-3} 14.50×10^{-3}	546 635	-13.0×10^{-3}	-3.4×10^{-5}
5375	250–319	0.06 −8.75	250–318	0.24 −7.01	1.05×10^{-3} 10.50×10^{-3}	250 315	87.0×10^{-3}	14.8×10^{-5}
	319–580	1.13 0.33	318–573	1.13 0.52	9.50×10^{-3} 9.50×10^{-3}	326 540	9.5×10^{-3}	0.0
	580–650	2.28 7.04	573–650	2.03 5.85	13.62×10^{-3} 9.25×10^{-3}	582 636	-59.5×10^{-3}	-8.1×10^{-5}
6871	250–347	0.44 −3.68	250–371	0.61 −2.33	-11.55×10^{-3} -1.35×10^{-3}	264 344	67.5×10^{-3}	12.9×10^{-5}
	347–508	1.30 3.26	371–503	1.39 3.77	-9.15×10^{-3} -3.75×10^{-3}	376 496	25.5×10^{-3}	4.5×10^{-5}
	508–(558)	(0.39) (−2.56)	503–(567)	(0.57) (−1.53)	(-6.1×10^{-3}) (-3.4×10^{-3})	508 547	(51.5×10^{-3})	(6.9×10^{-5})
	(558)–(600)	(1.86) (6.26)	(567)–(600)	(1.86) (6.14)	(-6.0×10^{-3}) (-6.0×10^{-3})	574 619	(-6.0×10^{-3})	(0.0)

Figures set in parentheses are uncertain.

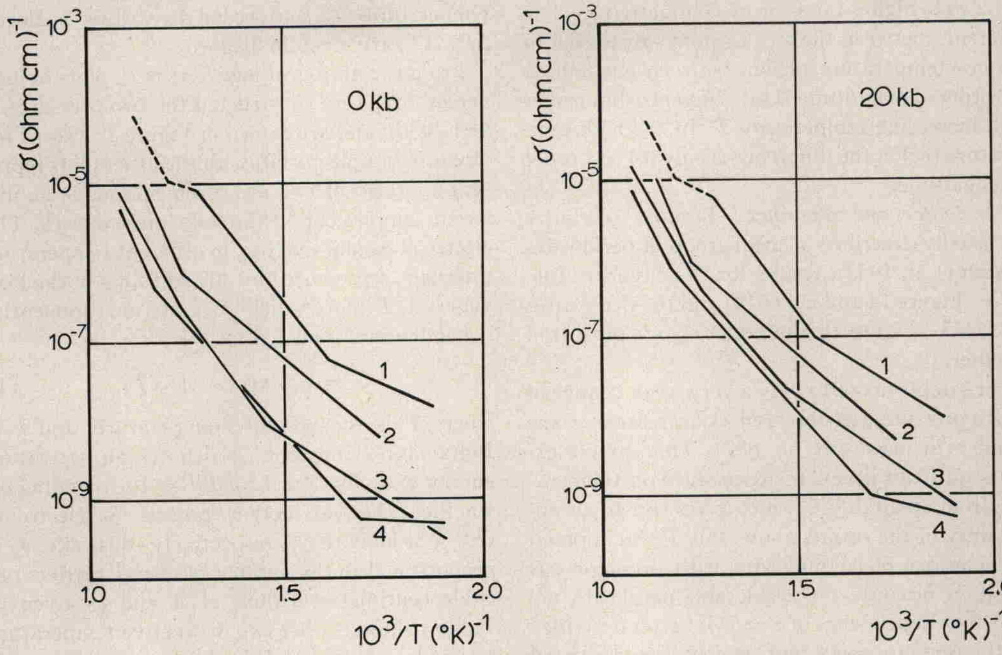

FIG. 2. Conductivity versus $1/T$ for peridotites and olivinites: *1*—6871 (broken line—uncertain interpretation); *2*—6013; 3—6014; *4*—5375.

by higher values between 1.75 and 2.3 eV. The lower interval is sometimes divided into two smaller intervals, characteristic values of A being about 0.6 and about 1.1 to 1.4 eV for the lower and the higher, respectively. The dividing temperature of the two intervals with sample no. 6014, no. 6871, and no. 5375 lies between 320 and 415°C. The smaller value of A for sample no. 5375 is about 0.06 eV. It is very likely that this value is in error due to the leakage resistances through the pyrophyllite sample holder, which were comparable to the measured value.

With increasing pressure a change of A was also noted. In the low-temperature interval up to 535–580°C there is a tendency for the value of A to increase. This is in contrast to the high-temperature interval, which is generally characterized by a decrease of A with increasing pressure.

After finishing the experiment on one of the peridotites, no. 5375, another set of measurements at pressures from 1 to 10 kb and temperatures between 300 and 600°C was taken without removing the specimen from the pressure vessel (Figure 1b). Similar to the previous measurement, an increase of $\log\sigma$ with pressure, linear from about 2 kb, was found but the values were about one and one-half order of magnitude higher than those found formerly. The difference between the two runs starts to decrease at about 500°C suggesting the identical value to be reached at about 880°C (for extrapolated 0 kb).

Dunites.—The following is a summary of the results of measurements on six different samples of dunite. Four of the samples were measured only once, while repeated measurements were made on two samples (no. 5556 and no. 5577), in both cases on different cuts of the same block of rock. With sample no. 7198 (Figure 1d), up to the temperature about 330°C, a decrease of σ with increasing pressure was observed. Between 330°C and approximately 450°C, only a small change with pressure was found. This is also the case of samples no. 5556 and no. 6672 up to temperatures about 520 or 420°C, respectively. Above this limit in all three samples (450, 520, 420°C, respectively), and in the whole temperature range with samples no. 5577 and no. 7199, an increase of σ with increasing pressure was observed. Sample no. 4825 (Figure 1c), however, exhibits a rather strong decrease of σ throughout the whole pressure range, with a diminishing tendency at higher temperatures.

As before, plots of $\log\sigma$ versus $1/T$ were con-