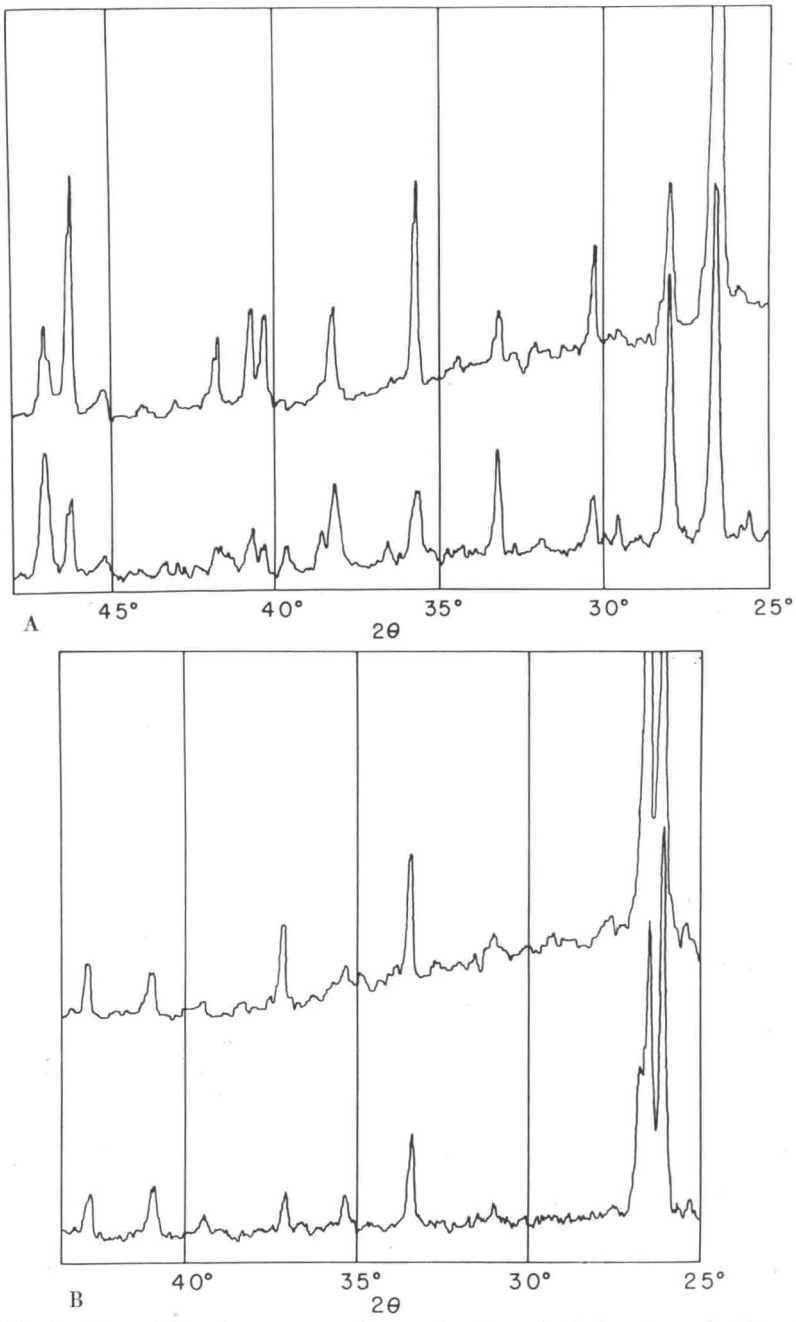

Fig. 1. X-ray diffraction patterns of natural and synthetic kyanite and sillimanite (Cu-K_a radiation). A: upper curve—natural kyanite; lower curve—synthetic kyanite. B: upper curve—natural sillimanite; lower curve—synthetic sillimanite.

TABLE 2

Experiments Results

(Kao = kaolinite, G = gibbsite, A = andalusite, Ky = kyanite, S = sillimanite, Q = quartz, C = corundum. *Metastable phase.)

Run No.	Pressure (bars)	Temperature (°C.)	Duration (hrs.)	Reactants	Products
38	19,100 ± 100	975 ± 25	1½	Kao + G	Ky
40	18,600 ± 500	1000 ± 100	1	Kao + G	Ky
41	21,200 ± 100	910 ± 90	1¼	Kao + G	Ky + Q* + C*
44	18,900 ± 300	1000 ± 25	1½	A	Ky + Q* + C*
48	21,400 ± 200	1035 ± 20	1¾	Kao + G	Ky
				A	Ky
49	12,100 ± 100	1045 ± 30	1½	A	S + Q* + C*
				Kao + G	S + Q* + C*
51	24,400 ± 300	1320 ± 20	1	A	Ky
53	12,500 ± 100	1050 ± 25	1¼	Kao + G	S + Q* + C*
66	23,400 ± 100	1080 ± 50	1¼	Al_2SiO_5 gel	Ky + Q* + C*
78	16,000 ± 100	1100 ± 20	1	Kao + G	S + Q* + C*
				A	S + Q* + C*
79	7,500 ± 100	750 ± 100	1½	Kao + G	S + Q* + C*
85	12,200 ± 200	845 ± 20	3¼	Kao + G	S + Q* + C*
88	22,600 ± 400	>1280	¼	Kao + G	Ky
				A	S
90	17,000 ± 100	975 ± 30	2¾	Kao + G	S + Q* + C*
		1055 ± 30		Kao + G	Ky* + Q* + C*
91	17,000 ± 100	1020 ± 20	3¼	Kao + G	S + Q* + C*
93	18,600 ± 200	1015 ± 10	3	Kao + G	Ky + Q* + C*
95	22,900 ± 400	1325 ± 50	1	Kao	Ky + Q
101	21,800 ± 100	1250 ± 200	½	Kao	Ky + Q
				A	S
106	21,000 ± 100	1245 ± 30	1	A	Ky
		1305 ± 30		Kao	Ky + S + Q
112	19,600 ± 100	1260 ± 25	1½	Kao	S + Q
				A	S + Q* + C*
115	18,100 ± 100	1110 ± 30	½	Kao	S + Q + C*
117	19,000 ± 100	1105 ± 15	3	Kao	S + Q
120	23,900 ± 200	1220 ± 50	2¾	S	Ky
127	17,700 ± 100	995 ± 10	6½	Kao	S + Q + C*
128	18,600 ± 100	1340 ± 30	7¾	Ky	S + Ky*

IDENTIFICATION OF PHASES

Preliminary identification of phases produced was made on a Norelco high-angle x-ray diffractometer, using Cu-K_α radiation. The diffraction patterns of the synthetic products were compared with those of natural kyanite and sillimanite (fig. 1). The x-ray patterns of sillimanite and mullite differ in 2θ between 50° and 60° (Kennedy, 1955 and personal communication), and the patterns of the synthetic sillimanite match that of natural sillimanite in this interval. The synthetic sillimanite has $n_\alpha = 1.655 \pm 0.005$ and $n_\gamma = 1.675 \pm 0.005$. These indices are slightly lower than those of natural sillimanite ($n_\alpha = 1.657 - 1.661$, $n_\gamma = 1.677 - 1.684$), but they are considerably higher than those of mullite ($n_\alpha = 1.642$, $n_\gamma = 1.654$). Most natural sillimanite contains a small amount of iron, and this may account for the higher indices.