



Fig. 10. Plot of mole % CH<sub>4</sub> generated and the residual wt % CH<sub>2</sub> in the solid for the dolomite-hydrogen system at 620°C; 5000 psi (H<sub>2</sub>); for 2, 4, 8, and 12 hour experiments.

only in very small amounts. Both of these experiments were run at a lower pressure of 2000 psi. The discussion on the reaction gases for the calcite-hydrogen experiments applies also to the dolomite-hydrogen system.

The kinetics of the dolomite-hydrogen system are considerably more complex than in the calcite-hydrogen system. An evaluation of the rate constant for each successive concentration-reaction time pair at 620°C assuming the reaction is first, second or third order, shows wide scatter, and no trend for the rate constant. The wide divergence from linearity is illustrated by a plot of the Arrhenius equation for a plot of the six temperature-concentration pairs. An interpretation of kinetic data into physical terms for this system is not realistic with the limited data available.

#### SIDERITE AND H<sub>2</sub>

The reaction between one-half gram of 40 to 60 mesh siderite fragments and hydrogen is more complex than the preceding calcite-hydrogen and dolomite hydrogen reactions. It is also the least studied with only four experiments. These four runs were between 400 to 605°C and 2000 to 5000 psi (H<sub>2</sub>), all for 4 hours. A "thermal soak" under helium was used in

TABLE 4. MASS SPECTROGRAPHIC ANALYSES OF REACTION GASES AND WET-CHEMICAL ANALYSES OF RESIDUAL CO<sub>2</sub> IN UNREACTED DOLomite; DOLomite-HYDROGEN SYSTEM

Experiment No.	Temperature (°C)	Pressure (psi)	Time (hours)	Mole % CH <sub>4</sub>	Residual WT % CO <sub>2</sub>
39	520	5,000	4	1.5	31
40	525	5,000	4	1.6	25
41	550	5,000	4	1.9	25
42	550	5,000	4	1.9	25
43	620	5,000	4	1.6	20.5
44	735	5,000	4	1.5	20.5
45	620	5,000	8	1.9	25
46	620	5,000	12	2.1	20.5
47	620	5,000	12	2.1	20.5
48	735	5,000	4	1.5	20.5
49	735	5,000	4	1.5	20.5
50	735	5,000	4	1.5	20.5
51	735	5,000	4	1.5	20.5
52	735	5,000	4	1.5	20.5
53	735	5,000	4	1.5	20.5
54	735	5,000	4	1.5	20.5
55	735	5,000	4	1.5	20.5
56	735	5,000	4	1.5	20.5
57	735	5,000	4	1.5	20.5
58	735	5,000	4	1.5	20.5
59	835	5,000	4	1.5	20.5
60	605	2,000	4	1.5	20.5
61	605	2,000	4	1.5	20.5
62	605	2,000	4	1.5	20.5
63	605	2,000	4	1.5	20.5
64	605	2,000	4	1.5	20.5
65	605	2,000	4	1.5	20.5
66	605	2,000	4	1.5	20.5
67	605	2,000	4	1.5	20.5
68	605	2,000	4	1.5	20.5
69	605	2,000	4	1.5	20.5
70	605	2,000	4	1.5	20.5
71	605	2,000	4	1.5	20.5
72	605	2,000	4	1.5	20.5
73	605	2,000	4	1.5	20.5
74	605	2,000	4	1.5	20.5
75	605	2,000	4	1.5	20.5
76	605	2,000	4	1.5	20.5
77	605	2,000	4	1.5	20.5
78	605	2,000	4	1.5	20.5
79	605	2,000	4	1.5	20.5
80	605	2,000	4	1.5	20.5
81	605	2,000	4	1.5	20.5
82	605	2,000	4	1.5	20.5
83	605	2,000	4	1.5	20.5
84	605	2,000	4	1.5	20.5