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Results of Hydrogenation of Upper Silesian Coal Samples in a Revolving Autoclave
By Grasse, Ludwigshafen, 2 March 1942

We received a 40 kg. sample, 0 to 10 mm, from the Fürstengrube, Vessola, Kreis Pless, on April 25, 1941, (K-1239), and a 35 kg. sample, #II nut, from the Valeskagrube, Mittel Lazisk, Kreis Pless, on October 20, 1941, (K-1248).

The coal samples contained 8.95 and 6.58%, respectively, of ash in the dry coal as delivered, and were de-ashed in the laboratory with a heavy solution (Schwerelösung) to 2.2 and 2.7%, respectively.

The analyses of these coals are given in Table I, in comparison with an average sample from Beuthen- and Heinitzgrube, (K-1242 of Apr. 28, 1941), run in a large scale experiment in Stall 804.

Both coal samples are somewhat lower in C-content and higher in volatile content than the comparative coal K-1242. The available H_2 in the Fürstengrube coal is about the same as in K-1242, while it is distinctly better in the Valeska coal. Fürstengrube, by comparison, has a higher chlorine content.

The results of hydrogenation are shown in Table II.

Practically equal values are obtained with both samples in hydrogenation in a revolving autoclave, although there are minor differences in the analyses. The lower C-content and higher chlorine content plainly have a favorable influence on the Fürstengrube coal, while with Valeska coal the greater available H_2 is advantageous for hydrogenation. Compared to the comparative coal K-1242, which has a higher C-content, both samples showed better results in conversion and asphalt. Gasification, based on equal splitting, is practically the same for all three samples. These coal samples are well suited to hydrogenation.

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TABLE I. ANALYTICAL DATA

	K-1239 Fürstengrube		K-1248 Valeskagrube		K-1242 Beuthen-Heinitz (Average)
	Original	De-ashed	Original	De-ashed	
% ash in dry coal	8.95	2.19	6.58	2.74	4.90
Analyses/pure coal					
% C	78.74	80.23	81.41	81.32	82.74
H	4.89	4.96	5.22	5.35	4.78
O	13.03	11.99	10.95	10.98	10.37
N	1.74	2.24	1.68	1.88	1.77
S, volatile	1.60	0.45	0.74	0.45	0.32
S, total	1.85	0.63	0.98	0.67	0.56
Cl	0.013	0.13	-	0.026	0.025
% volatile	38.82	39.43	40.31	39.26	37.09
Available H	3.53	3.68	4.24	4.37	3.74
Alkalinity, gH_2SO_4/Kg Dry Coal	27.00	12.1	27.7	-	17.7
L.T.C. Anal/pure coal					
% crude tar	9.92	11.80	13.26	13.91	9.99
% pure coke	75.10	73.71	74.57	75.46	77.59
Ash analyses					
% SiO_2	27.96	22.97	25.09	24.27	34.99
Fe_2O_3	23.95	17.40	18.32	14.23	10.76
Al_2O_3	20.60	31.07	22.49	31.66	26.01
CaO	9.45	12.27	11.56	9.94	9.60
MgO	4.32	2.94	6.10	4.61	4.81
K_2O + Na_2S	1.20	1.44	1.10	1.08	1.55
SO_3	7.04	7.15	12.29	10.47	9.59
P_2O_5	3.53	3.63	4.71	2.75	0.83
Cl	-	-	-	Traces	-
TiO_2	1.28	1.43	0.86	0.98	1.57

Results of Hydrogenation @ 600 atm.

Conditions of Experiments:

Preheat time, 3 hrs.
Reaction " 3 "
Temperature, 23.5 mV (450° C)
Pressure, 600 atm.
Catalyst, 1.2% $FeSO_4$ + 1.5% Bayermass + 0.3% Na_2S (Sulfigran)
Pasting Oil, bit. coal tar heavy oil + Pitch (9:1)
Coal:Oil = 1:1

TABLE II

	K-1239 Fürstengrube de-ashed	K-1248 Valeskagrube de-ashed	K-1242 Average sample Beuthen-Heinitz
Conversion	98.3	98.2	96.0
Spec. Grav. of oil/20°C	1.052	1.038	1.060
% asphalt in oil	3.7	3.8	5.0
% " in heavy oil	6.1	6.5	7.8
% new formation-325°C	100.5	98	94
% gasif/new form. + gasif.	21.7	21.0	20.5