



## Petrography of coals with different rank from nine Bulgarian coal basins, type and origin of the ancient peat bogs

### Петрография на въглища с различен ранг от девет български въглищни басейна, тип и произход на древните торфени блата

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Nine Bulgarian coal basins were sampled and investigated for their petrography and mineralogy. The origin of three of the coal basins was determined to be ombrotrophic bogs (Kyustendil basin, Oranovo-Simitli basin, Dobrudzha basin). Three other coal basins were determined to be mesotrophic bog forests (Sofia basin, Katrishte deposit, Pernik basin), and additional three were ombrotrophic bog forests (Chukurovo basin, Balkan basin, Svoge basin). There is no established relationship between the rank of the coals, the lithology of the coal-bearing layers, and type of the peat bogs. Three of the basins have similar origin. Pernik, Oranovo, Chukurovo and

Svoge basins originated in forested peatlands (telmatic swamps) when relatively high in coal ash and/or interbedded with mineral partings; and in forested, continuously wet raised bogs when low in ash. The Sofia, Kyustendil and Balkan basins are originated in intermittently dry forested swamps when high in ash, or in forested raised bogs when coal ash is low or moderate. The Dobrudzha basin and Katrishte deposits originated in slowly subsiding, intermittently dry swamps from aerobically decomposed autochthonous plants, which were redistributed as subaqueous sediment or in slowly subsiding, relatively dry raised bogs.

*Table 1. Low rank coal (all matter)*

Average, %	Sofia	Kyustendil	Katrishte	Oranovo	Chukurovo	Pernik
Number samples	253	20	43	137	20	30
Rank	lignite	lignite	lignite	lignite	lignite	sub-bituminous-B
Rr	0.23	0.30	0.31	0.33	0.37	0.48
Rmin	0.20	0.24	0.24	0.30	0.32	0.39
Rmax	0.25	0.36	0.38	0.04	0.39	0.56
Ash	18.30	36.00	32.00	8.84	n.d.	16.8
Textinite	10.00	5.00	0.01	0.00	16.51	4.00
Texto-ulminite	15.00	15.00	7.00	10.00	36.50	30.00
Eu-ulminite	20.00	35.00	13.00	30.24	20.24	39.95
Attrinite	10.00	13.00	7.00	13.50	3.33	5.00
Densinite	9.00	12.00	48.00	13.50	0.80	5.00
Gelinite	1.00	1.00	0.01	4.00	0.00	1.00
Phlobaphinite	3.00	2.00	1.00	2.00	4.79	1.00
Pseudo-phlobaphinite	1.00	1.00	1.00	1.00	0.70	0.00
Sporinite	4.00	2.50	2.00	3.00	0.13	1.00
Cutinite	1.00	0.01	0.01	0.01	0.13	0.01
Resinite	3.00	1.00	1.00	2.00	10.39	2.00
Suberinite	3.00	0.01	0.00	1.00	1.86	0.00
Alginate	1.00	0.47	0.01	7.00	0.13	0.01
Liptodetrinite	3.00	1.00	2.00	1.00	1.60	1.00
Fluorinite	0.00	0.00	1.00	0.75	0.00	0.00
Chlorophyllinite	0.00	0.00	0.00	0.00	0.01	0.00
Bituminite	0.00	0.00	3.00	0.00	0.00	1.00
Fusinite	1.00	1.00	1.00	0.00	0.01	0.01

Table 1. (continued) Low rank coal (all matter)

Average, %	Sofia	Kyustendil	Katrishte	Oranovo	Chukurovo	Pernik
Semifusinite	0.00	0.00	0.00	0.00	0.00	0.01
Macrinite	0.00	0.00	0.00	0.00	0.00	0.00
Sclerotinite	1.00	0.01	0.01	1.00	0.13	0.01
Inertodetrinite	1.00	2.00	3.00	1.00	0.13	1.00
Vitrinite group	69.00	81.50	77.02	74.24	66.49	85.95
Liptinite group	15.00	4.99	9.02	14.76	14.12	5.02
Inertinite group	3.00	3.01	4.01	2.00	0.27	1.03
Mineral matter	13.00	8.00	10.00	9.00	3.06	8.00
GWl	0.70	0.42	0.80	0.30	0.10	0.07
VI	4.80	2.42	9.80	1.77	22.35	9.90
TPI	7.13	2.80	0.38	3.14	78.76	9.12
GI	11.15	19.53	19.67	78.00	634.15	95.17
Mire	Mesotrophic bog forest	Ombrotrophic bog	Mesotrophic bog forest	Ombrotrophic bog	Ombrotrophic bog forest	Mesotrophic bog forest

Table 2. High rank coal (all matter)

Average, %	Dobrudzha	Balkan	Svoje
Number samples	20	15	20
Rank	high volatile bituminous-A	high volatile bituminous-A	anthracite/meta-anthracite
Rr	0.79	1.12	4.89
Rmin	0.80	0.94	4.50
Rmax	0.83	1.29	5.64
Ash	21.40	17.50	27.50
Tellinite	1.16	1.83	10.14
Telocollinite	12.12	46.80	81.04
Desmocollinite	47.31	4.59	0.00
Pseudo-Phlobaphinite	0.00	0.00	0.00
Vitrodetrinite	0.00	18.35	5.51
Phyllovitrinite	0.05	0.00	0.00
Macro-sporinite	0.14	0.00	0.00
Tenui-sporinite	12.39	0.00	0.00
Crassi-sporinite	0.34	0.00	0.00
Cutinite	0.00	0.00	0.00
Liptodetrinite	1.67	0.00	0.00
Bituminite	0.00	1.83	0.00
Exsudatinitite	0.05	0.00	0.00
Pyrofusinite	0.83	3.67	0.01
Semipyrofusinite	0.20	0.00	0.00
Degradofusinite	8.07	0.01	0.00
Semidegradofusinite	3.20	0.00	0.00
Macrinite	0.20	0.00	0.00
Semimacrinite	0.05	0.00	0.00
Sclerotinite	0.10	0.01	0.00
Sclerotinite-Plectenhiminitite	0.39	0.00	0.00
Inertodetrinite	11.57	2.75	0.01
Vitrinite group	60.65	71.57	96.69
Liptinite group	14.59	1.83	0.00
Inertinite group	24.61	6.44	0.02
Mineral matter	0.15	20.16	3.29
GWl	0.00	0.38	0.02
VI	0.35	7.12	92.46
TPI	0.43	7.20	92.46
GI	2.55	11.15	97.97
Mire	Ombrotrophic bog	Ombrotrophic bog forest	Ombrotrophic bog forest