THE INFLUENCE OF THE TYPE OF QUINOLINE INSOLUBLES ON THE QUALITY OF COAL TAR BINDER PITCH

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The Coal Tar Research Association, now amalgamated with the British Carbonization Research Association, has been running a cooperative series of tests on coal tar pitch binders with aluminum producers. Some of the tests have already been reported in the literature[1]. A more recent series[2], concerned with the importance of the nature of the quinoline insolubles, QI, also has relevance to the graphite electrode producer. The seven pitches involved have been evaluated as binders by measuring the flexural strength of 19 mm diameter graphite electrodes. The evaluation was carried out at British Acheson Electrodes Limited (Union Carbide Corporation).

The pitches were produced from a single tar. The tar was centrifuged into QI-rich and QI-lean fractions by the British Steel Corporation. The Pitch A produced from the QI-rich tar is a typical graphite electrode binder pitch. The seven pitches denoted A through G were produced by CTRA. It will be appreciated from the table that the pitches differ principally in the type, or origin, of the QI, viz. "natural", carbon black, and mesophase. Two pitches were produced by straight-run distillation: these contain the so-called "natural" QI. A third, natural QI, pitch was made by mixing low QI pitch with QI concentrate. The QI content of the low QI pitch was also increased both by the addition of a carbon black in attempt to simulate natural QI, and by the addition of mesophase through heat treatment.

A conventional processing scheme, an all-flour petroleum coke, and a common binder level (25% w/w pitch), were adopted. No effort was made to optimize the process to each binder. The 19 mm rods were all baked, and graphitized, together as a group.

There are two conclusions to be drawn from the results summarized in the table:

(a) The typical electrode pitch (QI-rich pitch A) is superior.

(b) The addition to the QI-lean material of QI as natural QI concentrate, carbon black, and mesophase through heat treatment, did not upgrade the lean material.

References

1. Mason, C. R., Fuel 1970, 49, 165.

2. Betts, W. and Sharp, J., private communications.

PITCH						GRAPHITE PROPERTIES			
	Properties								
Description	SP, °C Mettler	MCC %	BI %	QI %	QI type	Density Mg/m³	Flexural Strength MN/m²	σ	n
Pitch A, produced from QI-rich fraction by distillation.	108	58.2	35	13	natural	1.54	16.1	1.2	8
Pitch F, produced from QI-lean fraction by distillation.	112	55.4	28	4	natural	1.50	14.4	0.5	7
Pitch D is pitch F enriched with natural QI concentrate.	114	58.8	35	13	natural	1.53	14.7	0.7	6
Pitch B, produced from QI-lean tar heat soaked at 410°C.	113	58.1	36	14	4% natural 10% mesophase	1.49	11.4	0.9	6
Pitch G, produced from QI-lean tar heat soaked at 380°C in presence of 1.8 dinitronaphthalene.	114	58.1	36	15	4% natural 11% mesophase	1.52	12.4	0.7	7
Pitch C, produced from QI-lean tar distilled after addition of carbon black.	110	56.7	31	13	4% natural 9% black	1.51	14.5	0.8	6
Pitch E is pitch F with added carbon black.	112	57.1	33	12	4% natural 8% black	1.52	13.8	0.2	6

Notes (1) The mesophase content (as QI) was calculated by difference.
(2) SP = Softening Point MCC = Modified Conradson Carbon n = number of rods processed.
(3) The carbon black used was Philblack G, ASTM No. N660, a furnace black of particle size 460 Å.