POSTER

MODIFICATION OF CARBONIZATION PROPERTIES OF COAL TAR PITCH WITH QUINOLINE ENTRAINED SUPERCRITICAL TOLUENE

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INTRODUCTION

In a previous study, the authors reported applicability of supercritical fluid extraction to the fractionation of pitch[1]. Supercritical toluene was very useful because of its large change in density, that is dissolving power, depending upon temperature and pressure. It means the possibility of control of extraction degree on pitch. However, the steep change of dissolving power of the solvent caused some difficulties on an adequate control of composition of residual pitch.

Adding small amounts of a different solvent to another main one could change the properties of mixed solvent. It could increase the dissolving power of solvent and the selectivity for a certain component of concern. The choice of adding solvent, entrainer, depends on what should be controlled. Quinoline have a good dissolving power on high molecular weight molecules and polar ones. So, the adding of quinoline to supercritical toluene could affect the dissolving power and the selectivity for heavy molecules of fluid.

In this study, different amounts of quinoline were added to supercritical toluene to modify the carbonization properties of coal tar pitch, and the preparation possibility of a high fusible mesophase pitch was investigated.

EXPERIMENTAL

Selected properties of a precursor pitch and the details of experimental apparatus were already described in previous paper[1]. Primary QI-free coal tar pitch was selected as a precursor.

The experimental apparatus consisted of a 300 ml stainless autoclave equipped with a Magnedrive stirrer. The extractor was charged with 10 g of pitch and was heated at 5 ℃/min. Once the extraction temperature was reached, ambient solvent was injected into the extractor from a solvent reservoir using high pressure pump at the flow rate of about 500 ml/hr. The pressure was maintained during the extraction by adjusting the throttling valves and the gaseous phase was condensed by a water-cooled condenser and the solvent and extract collected. Extraction time was measured from the time of pressure maintenance and kept at 1.5 hr during experiment.

RESULTS AND DISCUSSION

Table 1 shows the effects of temperature, pressure and quinoline content on extraction yield. The extraction yield could be varied with a dissolving power of fluid and a vapour pressure of pitch. These two parameters effect on extraction at a same time but different intensity follow the condition. In general, the dissolving power of fluid is a main parameter on extraction at the vicinity of critical point of solvent, but the vapour pressure of solute at higher temperature. The data in table 1 shows this system follow the general behaviour of supercritical fluid extraction system.

The addition of quinoline to supercritical toluene made changes on a composition of residue compared with a process which uses toluene only.

Fig.1 and Fig.2 show the composition change of extraction residue with the extraction condition. TI and QI of residue increase with extraction pressure in the case of toluene system and it's because of the increasing of extracted fraction without any selectivity for some component. 10% of quinoline added toluene system, however, shows extremely different trend. When the extractions were performed far from the critical pressure of toluene, such as 27 and 67 bar, the result is so similar with that of toluene system, but at the vicinity of critical pressure of toluene the result changes depend on extraction temperature. It shows the changes of extraction selectivity depend upon the addition of quinoline on supercritical toluene, and the selective dissolving of quinoline on bigger molecules.

The polarized micrograph photo of residue showed the mesophase formed during extraction without further heat treatment, and, compared with toluene system, quinoline entrained toluene could contribute to the formation of high fusible mesophase pitch.

CONCLUSION

The addition of quinoline to toluene influenced extraction selectivity and the formation of high fusible mesophase pitch.

REFERENCE

1. Kim,C.J., Choi,Y.J., Shim,H.B., Ryu,S.K., and Rhee,B.S. : Carbon '94, Granada, Spain, 96 (1994).

Table 1. The weight percent of extracted pitch at different extraction conditions

Quinoline content(wt%)	T(℃)	P (bar) 26.9	47	67.2
0	325	19.67	51.59	64.03
	345	28.02	33.69	56.20
	365	31.49	38.48	47.03
3	325	20.03	59.02	67.50
	345	27.50	39.35	60.53
	365	32.02	41.81	51.03
7	325	20.05	72.18	70.73
	345	28.05	41.39	64.92
	365	31.50	45.27	55.90
10	325	21.71	68.55	73.60
	345	27.60	26.61	68.53
	365	32.26	42.42	59.27

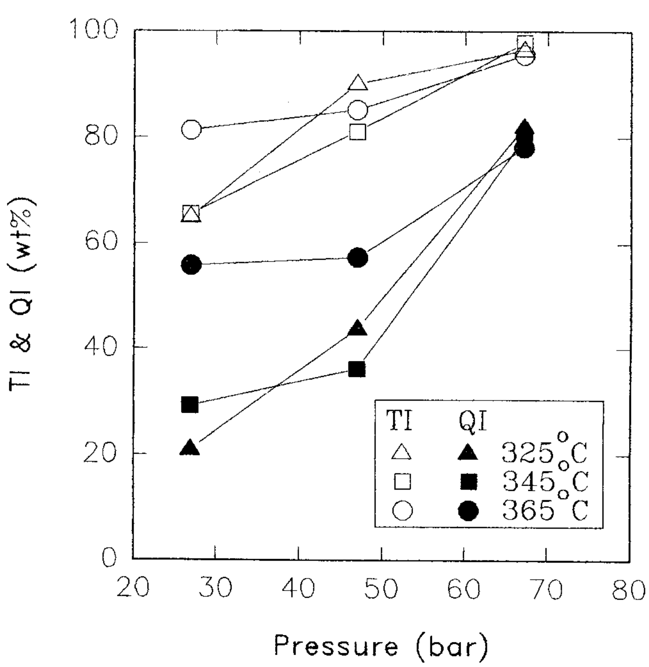

Fig.1. TI and QI of extraction residue (0% of quinoline entrained).

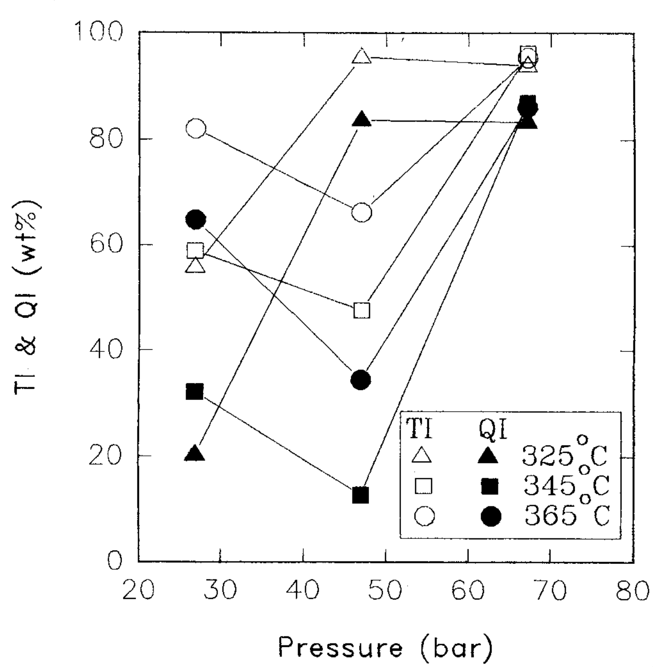

Fig.2. TI and QI of extraction residue (10% of quinoline entrained).