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PHASE BEHAVIOR OF SOME LINEAR POLYPHENYLS

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This paper reports melting temperatures and latent heats of five linear polyphenyls, benzene through p-quinquephenyl. Latent heats for p-quaterphenyl and p-quinquephenyl, including the crystal-nematic and nematic-isotropic transitions of the latter, are given here for the first time.

The transition temperature and latent heat measurements were performed by means of a differential scanning calorimeter.¹ Phase behavior was measured over temperature range from about 273 K (0°C) to 773 K (500°C). Samples were encapsulated by cold-welding in two-piece aluminum pans which had been annealed at 673 K for 20 sec. to assure a hermetic seal.^{1,2} Temperature and latent heat calibration was obtained against a high-purity indium standard.

Samples were obtained from commercial sources and were run without purification. In most cases sample purification would have been difficult because of the small quantity of material available (100-1000 mg). Samples were reasonably pure, as estimated from the sharpness of the DSC transition peaks, and by comparison of transition temperatures to known values. Transition temperatures were determined from the positions of maximum DSC peak height. Latent heats were found by planimeter integration of peak areas, using the baseline correction of Smith.³

The transition temperatures and latent heats for the five compounds are listed in Table I. It can be seen that agreement with other thermal data (where available) is good. The two transitions observed for p-quinquephenyl are melting from the crystal (K) to the nematic (N) phase (KN transition) and the nematic-isotropic (NI) transition.

TABLE I. Melting behavior of p-polyphenyls.

Compound	Mol. Weight	Melting Data		Other Transitions	
		T(K)	L(KJ/mol.)	T(K)	L(KJ/mol.)
benzene	78.1	279.1 ^a	9.3 ^a		
		278.7 ^b	9.95 ^b		
		278.7 ^c	9.837 ^c		
		278.7 ^d	9.87 ^d		
biphenyl	154.2	344.1±.2 ^e	18.8±.5 ^e		
		343.7 ^b			
		341.5 ^c	18.6 ^c		
p-terphenyl	230.3	486.3 ^e	35.5±1.3 ^e		
		487 ^f	35.3 ^f		
		481 ^g			
p-quaterphenyl	306.4	587.2±.3 ^e	37.8±1.1 ^e		
		593 ^g			
p-quinguephenyl	382.5	659.6±.6 ^e	42.3±2.7 ^e (KN)	688.1±.9	0.922±.05 (NI)
		653 ^g		683 ^g	

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