Glassy Liquid Crystal of the Nematic Phase of *N*-(*o*-Hydroxy-*p*-methoxybenzylidene)-*p*-butylaniline

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In general, glass transition takes place through a delicate balance between the relaxation time of molecular motion and the time scale of observation. The ordinary glassy state can be established by quenching many supercooled liquids below their glass transition points without crystallization, and by other suitable procedures.[1-3] Adachi *et al.*[4] reported the possible existence of glassy state even in crystalline materials as the non-equilibrium state of many plastic crystals. We also reported the new finding of glassy state in the metastable liquid crystal of cholesteryl hydrogen phthalate (CHP) and proposed to designate this state as "**glassy liquid crystal.**"[5]

N-(*p*-Methoxybenzylidene)-*p*-butylaniline (MBBA)[6] is a rare example of nematic liquid crystal at room temperature and has widespread applications to display devices, but the material is relatively unstable against cleavage or reaction of the anil linkage. In contrast, OHMBBA, an *o*-hydroxy analog of MBBA which was recently synthesized,[7] has an intramolecular hydrogen bonding stabilizing the anil linkage. The melting point T_m of OHMBBA is 44°C and the enantiotropic transition T_{tr} from the nematic mesophase to the isotropic liquid is 64.5°C.

OHMBBA of special grade obtained from Tokyo Ohka Kogyo Co., Ltd. was dried in a vacuum by a freeze-and-thaw technique for 24 hr. Differential thermal analysis (DTA) was carried out. Typical results are illustrated in Fig. 1. Run 1 shows a heating curve of crystalline OHMBBA with a rate of 2.5K/min. Run 2 gives a cooling curve of the isotropic liquid with a rate of −12K/min. The transition from the isotropic

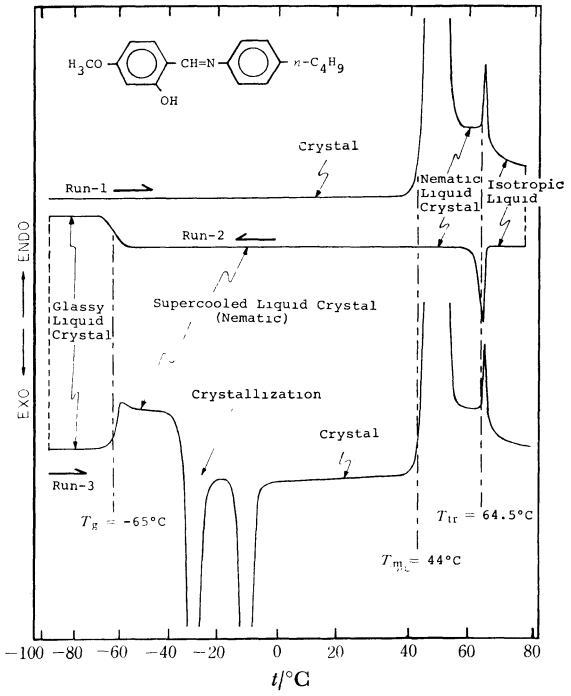

Fig. 1. DTA curves for *N*-(*o*-hydroxy-*p*-methoxybenzylidene)-*p*-butylaniline.

liquid to the nematic phase was observed even in a rapid cooling as fast as −80K/min. When the cooling rate was greater than −10K/min, the nematic mesophase was easily quenched to give a glassy state. Run 3 shows a heating curve of the glassy liquid crystal with a rate of 2.5K/min. A clear glass transition phenomenon was observed at −65°C. On further heating, the supercooled nematic liquid crystal was transformed into a stable crystal through a crystallization process around −30°C. The values of T_m and T_{tr} agree well with the previous data.[7]

Thus we found a glass transition phenomenon for a *stable* liquid crystal, but in the case of CHP it was observed only for a *metastable* one. In this respect, OHMBBA may be more appropriate material than CHP for studying the glass transition phenomenon in liquid crystals.

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