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Evolution of the isotropic to smectic-A phase transition in liquid crystal and acetone binary mixtures KRISHNA SIGDEL, GERMANO IANNACCHIONE, Worcester Polytechnic Institute — The first-order transition from the isotropic (I) to smectic- A(SmA) phase in the liquid crystal 4-cyano-4'-decylbiphenyl (10CB) doped with the polar solvent acetone (ace) has been studied as a function of solvent concentration by high- resolution ac-calorimetry. Heating and cooling scans were performed for miscible 10CB+ace samples having acetone mole fractions from $x_{ace} = 0.05$(1 wt.%) to 0.36(10%) over a wide temperature range from 310 to $327K$. Two distinct first-order phase transition features are observed in the mixture whereas there is only one transition (I-SmA) in the pure 10CB for that particular temperature range. Both calorimetric features reproduce on repeated heating and cooling scans and evolve with increasing x_{ace} with the high temperature feature relatively stable in temperature but reduced in size while the low temperature feature shifts dramatically to lower temperature and exhibits increased dispersion. Polarizing optical microscopy supports the identification of a smectic phase below the high-temperature heat capacity signature indicating that the low-temperature feature represents an injected smectic-smectic phase transition. These effects may be the consequence of screening the intermolecular potential of the liquid crystals by the solvent that stabilizes a weak smectic phase intermediate of the isotropic and pure smectic-A.

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