

Multiple glassy dynamics of a homologous series of triphenylene-based columnar liquid crystals – A study by broadband dielectric spectroscopy and advanced calorimetry

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The datasets presented here corresponds to an investigation of molecular mobility and phase behavior of a homologous series of triphenylene-based columnar liquid crystals, HATn, with different length of the alkyl chain (n=8,10,12). The names of the studied materials are HAT8, HAT10 and HAT12. Phase behavior of the samples are measured in the temperature range from 203 K to 403 K with a heating/cooling rate of 10 K/min using a conventional differential scanning calorimetry (DSC) instrument. A temperature program containing one heating/cooling cycle followed by a second heating run is employed. For measurements, the sample are encapsulated in a standard 50 µl aluminum pans. The DSC data can be found under “DSC” folder and in that folder individual folders named for each measured sample are located. Moreover under “DSC” folder, the baseline measurement file is given as “BaseLine_Measurement_Intercooler_-90_130_10Kmin.txt”.

Molecular mobility of the HATn materials is studied using Broadband Dielectric Spectroscopy (BDS) instrument. For the BDS measurements, the samples are prepared by sandwiching the sample between two gold-plated disk-shaped brass electrodes having diameter of 20 mm. The spacing between electrodes are maintained by 50 µm thick fused silica spacers in order to make a capacitor of the samples for the measurements. The BDS data is given under “BDS” folder where individual subfolders are named for each sample.

In addition to the BDS investigations on the molecular mobility, the glassy dynamics are further studied using so-called advanced calorimetric techniques, which are fast scanning calorimetry (FSC), temperature modulated FSC (TMFSC) and temperature modulated DSC (TMDSC). The FSC experiments are performed using chip-based power-compensated differential calorimetry technique and carried out in the temperature range from 183 K to 313 K with heating rates from 10 K/s to 10000 K/s. The FSC data can be found under “FSC” folder and in that folder individual subfolders are presented for each measured sample. In these subfolders, the FSC data is given separately for each heating rate applied during the measurements. For example, the files named as “10_HAT8_THIRD_-90Cto40C_10000to10_with1000Ks.cvs” and “200_HAT8_THIRD_-90Cto40C_10000to10_with1000Ks.cvs” corresponds to the FSC data for HAT8 measured with heating rate of “10 K/s” and “200 K/s” respectively. The TMDSC data are also named in the same way. In the subfolders named with each sample name and located under the “TMDSC” folder, there are 2 files given for each sample. For example, the one named as “0_HAT10_in_Empty4_vs_NewREF_TMDSC_-70Cto40c_60s_1min.txt” regards to the TMDSC measurement performed for HAT10 in temperature range from -70°C to 40°C with the isothermal period of 60 seconds (which corresponds to the measurement frequency). Moreover, the file named as “0_Sapphire_in_Empty4_vs_NewREF_TMDSC_-70Cto40c_60s_1min.txt” presents the data measured for a sapphire calibrant, which is measured in the same sample pan with the same conditions.

Finally, the TMFSC investigations are performed with two different isothermal periods of 1 s and 0.1 s. The TMFSC data is presented under the “FSC” folder and in that folder individual subfolders are presented for each measured sample. In each subfolder, two files are given e.g. “TMFSC_HAT8_0512ms_-90Cto40C.txt” and “TMFSC_HAT8_1014ms_-90Cto40C.txt” files represents the TMFSC data for HAT8 measured with isothermal periods of 1 s and 0.1 s respectively. It is important to note that the given data is measured at Bundesanstalt für Materialforschung und -prüfung (BAM), where is Unter den Eichen 87,12205 Berlin, Germany.