

Re: Comments for Annex XV restriction report (PFAS)

Supporting the comments of JNC Corporation about the substitution of fluorinated liquid crystal compounds by cyano compounds

Liquid crystalline materials for active-matrix liquid crystal displays (hereafter referred to as AM-LCDs) are highly sophisticated materials with special properties. One of the most important properties is the high electrical resistivity, because other properties like the voltage holding ratio depend on it. In order to obtain materials with high electrical resistivity the compounds have to be purified by special methods. But as has been shown in the paper *Mol. Cryst. Liq. Cryst.* 260, 1995 p. 13-21, there is a limit of the electrical resistivity depending on the chemical nature of the respective compound. In compounds with weak chemical bonds by inherent decomposition of the compounds polar impurities may be formed, which control the limit of the electrical resistivity and thus the voltage holding ratio. This means further attempts of purification cannot further improve the properties of the respective compounds.

It is well known that the C-F bond is one of the strongest available chemical bonds. Therefore fluorinated liquid crystalline compounds are extremely stable and have extraordinary properties like high electrical resistivity and high voltage holding ratio and depending on the detailed chemical structure high dielectric anisotropy and useful viscosity and optical properties. There is no other material which can compete with fluorinated liquid crystalline compounds. Materials containing cyano groups have high dielectric anisotropy and reasonable viscosity and optical properties. But due to their relatively low chemical stability cyano compounds tend to decomposition under the influence of electrical fields, irradiation or heat. Therefore their inherent electrical resistivity and voltage holding ratio is much lower than those of fluorinated materials. Therefore liquid crystalline compounds with cyano groups are not appropriate for application in modern AM-LCD's.

Liquid crystal displays are important in many products and applications in industrial countries. The prohibition of the application of fluorinated compounds in LCD's would mean the disappearance of LCD-TV's, smart phones, automotive displays and many other applications depending on liquid crystalline materials. With respect to the shown low deterioration of the environment and in order to prevent costly damage of the economy it is not reasonable to prohibit the use of fluorinated liquid crystalline materials.

Halle/Saale, May 2023



Prof. Dr. Dietrich Demus

International Scientific Consulting Office

Member of the German National Academy of Science 'Leopoldina'