7. ABSTRACT OF THE INVENTION

The present work relates to the liquid crystalline characteristics exhibited by pyridinium trifluoroacetate. This salt exhibited broad and stable mesophase.

5. CLAIMS:-

We claim

1. Pyridinium trifluoroacetate (Fig. 1) is an monotropic liquid crystal.
2. Pyridinium trifluoroacetate exhibited mesomorphic properties as shown in Figure (2 and 3).
3. Pyridinium trifluoroacetate exhibited broad and stable schilerin nematic phase between 88^0 C to 30^0 C
4. The schilerin nematic texture exhibited by pyridinium trifluoroacetate for the range between 88^0C to 30^0 C

6. DATE:- 15th January, 2014.

AND SIGNATURES

DR. M.M.V.RAMANA SANTOSH W. ZOTE DINESH N.NAVALE

4.DESCRIPTION:

Title : Preparation of pyridinium trifluoroacetate exhibiting liquid crystalline characteristics.

Abstract:

The present work relates to the liquid crystalline characteristics exhibited by pyridinium trifluoroacetate. This salt exhibited broad and stable mesophase.

Background and Prior Art :

Liquid crystals are compounds that exhibit mesomorphism between the crystalline solid and isotropic liquid. Due to this characteristics, they have found use in electro optical and display devices. Such materials are well known in the prior arts including US 2010/0231844A1, US Patent No. 4,629,290; US Patent No. 5,238,598 ; US Patent No. 3,751,467; US Patent No. 4,101,207; US Patent No. 4,789,751; US 2012/0313041A1; US 2012/0264984A1; U.S. Pat. No. 4,638,073, U.S. Pat.No. 4,705,874, US 2012/0273721A1, US 2012/0264980A1, US 2012/0264980A1; US 2011/0097519A1.

Ionic liquid crystals are a class of liquid crystalline materials that have found application in electrolytic study.(US 2012/0135316 A1)

Among the organic cations mesomorphisim of pyridinium salt has been known since 1938. (Knight, G. A., Shaw, B. D. , J. Chem. Soc., 1938, 46, 682-683.)

Further studie revealed that N-alkylation(i.e., presence of long alkyl chain) is necessary condition for these salts to exhibit mesomorphic characteristics.(Sucholter, E.J. R., Engbets, J.B.F.N., De Jeu, W.H., J. Phys. Chem. 1982, 86, 1908-1913.)

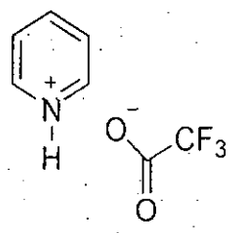
There is a report which states that it is not necessary to have long alkyl chain on the organic cation to induce mesomorphism, provided that an anion with long alkyl chain is present.(Ito, M., Matsunaga, Y., Matsuzaki, H., Shimojima, S., Bull. Shem. Soc. Jpn. 1989, 62, 3912). These compounds exhibited liquid crystalline properties and found use as lubricant additive, lubricant composition and grease composition. (Haramota, Yuichiro, TokkyoKoho 2012, JP 5077987 B2 20121121).

Pyridinium salt type of ionic acrylate derivative, its manufacture and liquid crystal composition for display is reported.(Haramot, Yuichiro, Jpn Kokai Tokkyo Koho, 2000, JP 2000086656 A 20000328 .)Pyridinium quarternary salts showed discotic liquid crystal. (Nishikawa, Naoyuki, Ogawas, Mastaka, Jpn Kokai Tokkyo Koho, 2002, Jp. 2002038158 A 20020206).

Most of the work reported on ionic liquid crystal have made use of heterocyclic organic cation forming salt with the various counter anions, like Cl^-, Br^- PF_6^- BF_4^-, etc., (Koen Binnemans, Chemical Reviews, 2005, Vol. 105, No. 11).All the reported ionic liquid crystal have mentioned the use of long alkyl chain either in the cation or anion, and involve multistep reactions.
There is not a single report which states the use of trifluoroacetate as a counter anion to form a liquid crystal material.
This is for the first time we are reporting the use of pyridine as cation and trifluoroacetate as counter anion to generate compound pyridinium trifluoroacetate, which was found to exhibit mesomorphic characteristics.

Description of the Work:

The main objective of the present work is to generate the compound.



(Fig. 1)

Pyridinium trifluoroacetate (Fig 1), which will exhibit required mesomorphic characteristics, by avoiding

1. Multistep reaction.
2. To exhibit broad and stable mesophase
3. To avoid the use of long alkyl chain in organic cation
4. To avoid the use of long alkyl chain in counter anion.

The present work is successful in achieving all the above objectives by making the use of trifluoroacetate as counter anion for the pyridinium cation.

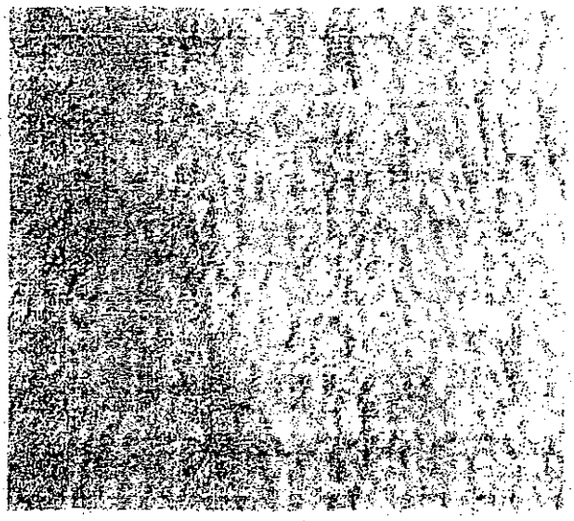
Above compound was prepared by using the standard literature procedure. (Joshua A. Mukhlall, William H. Hersh, Inorganica Chimica Acta 369 (2011) 62–70)

Procedure for the synthesis of pyridinium trifluoroacetate :-

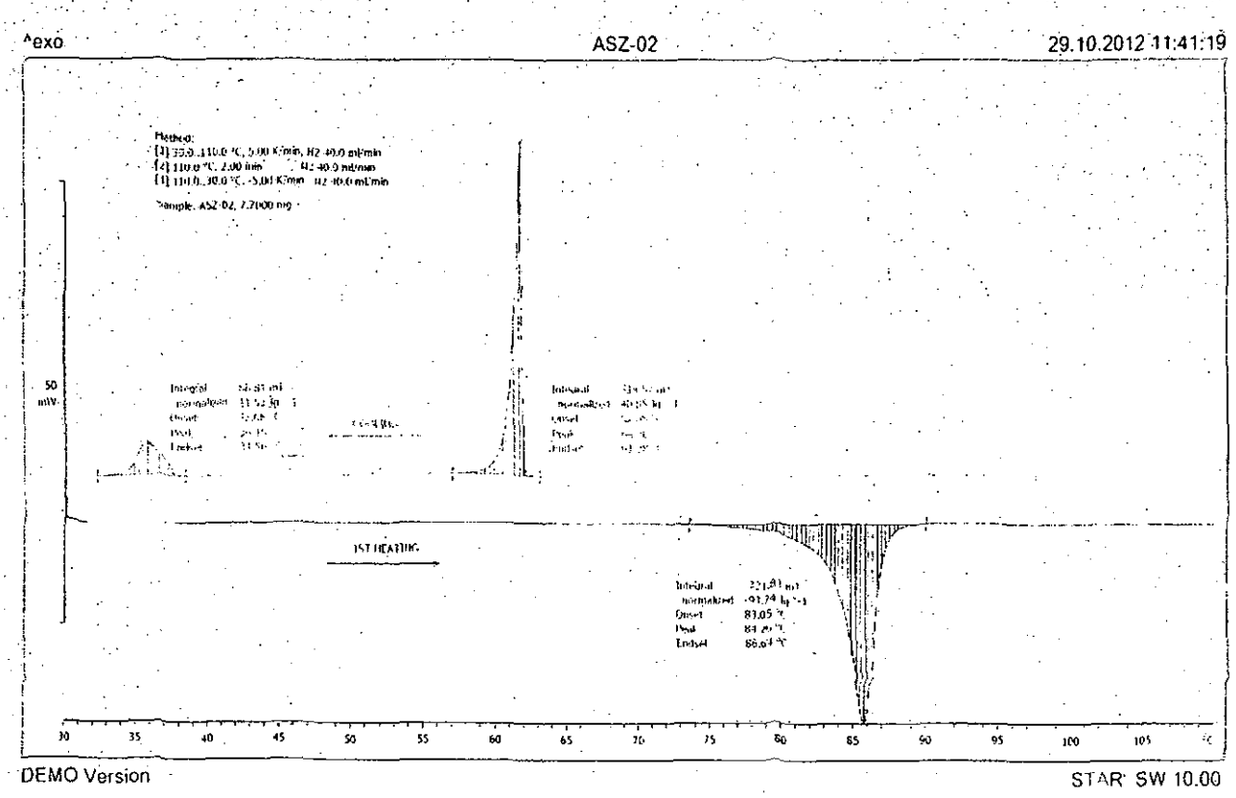
Trifluoroacetic acid (7.10 g, 62.3 mmol) was added slowly to a vigorously stirred solution of pyridine (4.90 g, 61.9 mmol) in 75 mL of ether. After 10 min the precipitate was filtered and dried to obtain white crystals(10.6 g, 88% yield), melting point 88°C.

Above salt was characterized by comparing the melting point and spectral data reported in the literature (Joshua A. Mukhlall, William H. Hersh, Inorganica ChimicaActa 369 (2011) 62–70).

Its liquid crystalline properties were investigated using DSC(differential scanning calorimetry) and POM (Polarising optical microscopy). The POM study revealed pyridinium trifluoroacetate to be monotropic liquid crystal exhibiting a schlieren nematic phase, which is also in agreement with the DSC data.



(Fig. 2)
Texture of pyridinium trifluoroacetate under POM at 75°C exhibiting schlieren nematic phase



(Fig. 3)
DSC of Pyridinium trifluoroacetate

5. CLAIMS:-

We claim

1. Pyridinium trifluoroacetate (Fig. 1) is an monotropic liquid crystal.
2. Pyridinium trifluoroacetate exhibited mesomorphic properties as shown in Figure (2 and 3).
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