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Growth, spectral, optical and thermal studies of an organic single crystal 4-N, N'-dimethylamino-N-methylstilbazolium 4-aminotoluene-3-sulfonate

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Abstract: Terahertz (THz) applications based ionic organic nonlinear optical single crystals of 4-N, N'-dimethyl amino-N-methylstilbazolium 4-aminotoluene-3-sulfonate (DAAS) are synthesized and grown by slope nucleation method coupled with slow evaporation technique (SNM-SE). The single crystal X-ray crystallographic analysis revealed that the crystal structure of DAAS is triclinic with space group P1. The elemental composition, linear and nonlinear optical properties are observed by FT-IR, UV-Vis and Kurtz-Perry NLO test. The thermal stability of the DAAS crystal was investigated by TG/DTA analyses using Perkin Elmer TGA-7 spectrometer.
Key words - organic compound; crystal growth; nonlinear optical; thermal behavior.

Introduction:

The syntheses of organic molecules with high nonlinearity have attracted much attention due to their potential applications in electro optic modulation, frequency conversion and terahertz wave generation [1]. Among the variety of organic materials, ionic organic crystals possess superior advantages compared non-ionic specious due to their high thermal, mechanical and photochemical stability combined with high chromophore concentration [2]. An ionic organic DAST (4-N, N-dimethylamino-N-methylstilbazolium tosylate) crystal is best example for this kind of materials with second harmonic generation SHG efficiency 1000 times than the reference urea at 1907 nm laser emission and also large second order NLO susceptibility $\chi^{(2)}$ = 2020±220 pm/V and electrooptic coefficient (r_{11}= 77 pm/V) at 800 nm making it a perfect choice for THz wave generation [3]. Recent studies are involved salt containing the chromophore of DAST combined with varietal counter ion afforded a number of new materials that are highly active for SHG [4-5]. It is proven that the stilbazolium cations are attractive species in ionic organic crystals because of the molecular nonlinearity can be simply preserved by varying the counter anions [6]. In this connection, Zun et al made an attempt to grow a