Analysing the synthesis and characterization of semi-organic compound tartaric acid ammonium chloride by slow evaporation method

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Single crystal synthesis, growth and characterization pose challenges such as impurities, temperature control issues and mechanical stress. The present study aims to address these issues by synthesizing and exploring the physico-chemical properties of a nonlinear semi-organic crystal, tartaric acid and ammonium chloride (TAAC). The crystal growth occurred via the slow evaporation method at ambient temperature using double-deionized water as a solvent. Physico-chemical properties were tested, and characterization included X-ray diffraction, scanning electron microscopy (SEM), and photoluminescence to analyse structure, purity and morphology. Additionally, Fourier-transform infrared spectroscopy, UV-visible spectra and micro hardness methods were employed to analyse the optical properties and determine band-gap energy. Antifungal and antibacterial activities against *Candida albicans*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* were evaluated using the agar-well diffusion method. TAAC demonstrated superior structure and characteristics compared to potassium dihydrogen phosphate crystals across all parameters.

optical behaviour, altering the properties of transmitted light[2]. Efforts to address challenges in producing effective NLO materials focus on semi-organic crystals. Unlike organic materials with weak properties, inorganic materials lack electron-p conjugation, but offer excellent thermal, optical and mechanical properties. Recent endeavours aim to develop semi-organic crystals with superior quality, including low angular sensitivity, high laser damage threshold, exceptional mechanical and thermal properties, and broad optical transparency, crucial for technology-sector device fabrication[3]. The photoacoustic approach accurately assesses thermo-physical properties of solid materials, specifically NLO single crystals, using slow evaporation solution technique (SEST), an economically feasible and user-friendly method[4]. Increased humidity fosters symmetrical and regular crystal formation due to slower evaporation, allowing ions more time to settle into energetically favourable positions, resulting in ideal crystal structures. Without this gradual development, ions bind randomly, leading to amorphous or flawed crystal structures[5]. The