Photocatalytic performance of mixed lithium niobates-tantalates prepared by mechanochemical methods

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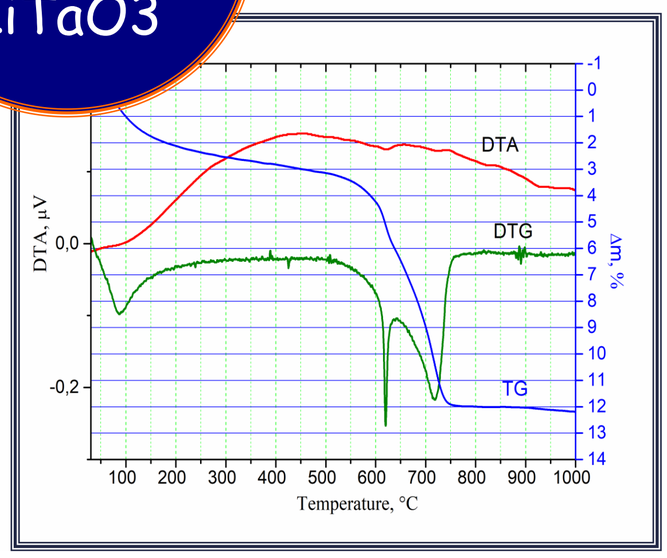
$LiNbO_3$/ $LiTaO_3$

Lithium niobate LN and tantalate LT are among the most frequently used materials of functional electronics. The nanoparticles of LN-LT can be more attractive for some practical applications. As the wide-gap semiconductors, LN and LT powders are also prospective photocatalysts under UV irradiation. High energy milling belongs to effective method for preparation of oxide materials in nano-sized state. It promotes activation of reagents and their interaction with perovskite phase formation which becomes **photocatalytic activity under visible irradiation.**

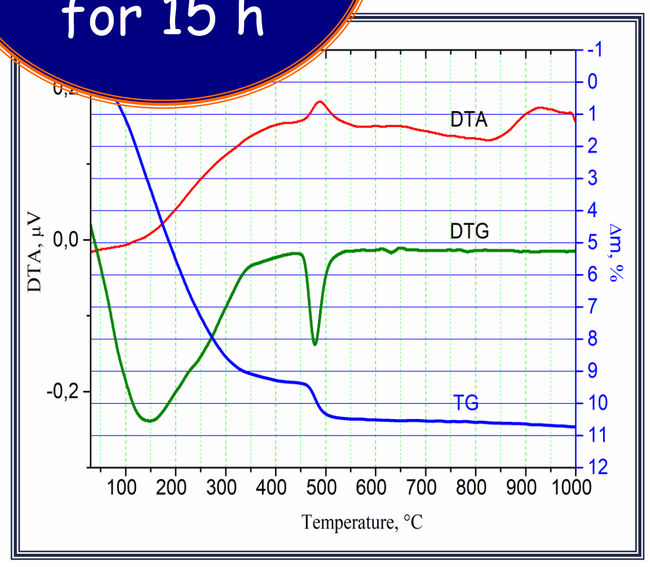
$$Li_2CO_3 + (1-x)Nb_2O_5 + xTa_2O_5 \rightarrow LiNb_{1-x}Ta_xO_3 + CO_2 \quad (x = 0,\ 0.25,\ 0.5,\ 0.75,\ 1)$$

1 stage: mechanochemical treatment (MChT) in air at 600 rpm for 5-15 h
2 stage: hydrothermal treatment (HTT) at 250-280°C or thermal treatment (TT) at 550-700°C

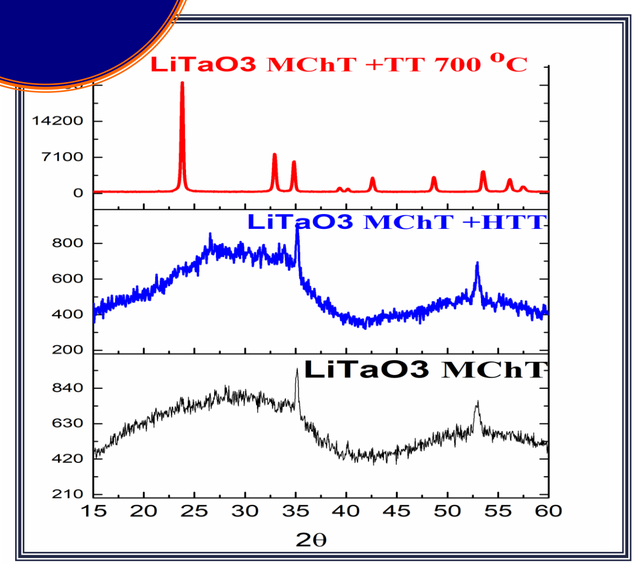
Mixture for obtaining of $LiTaO_3$

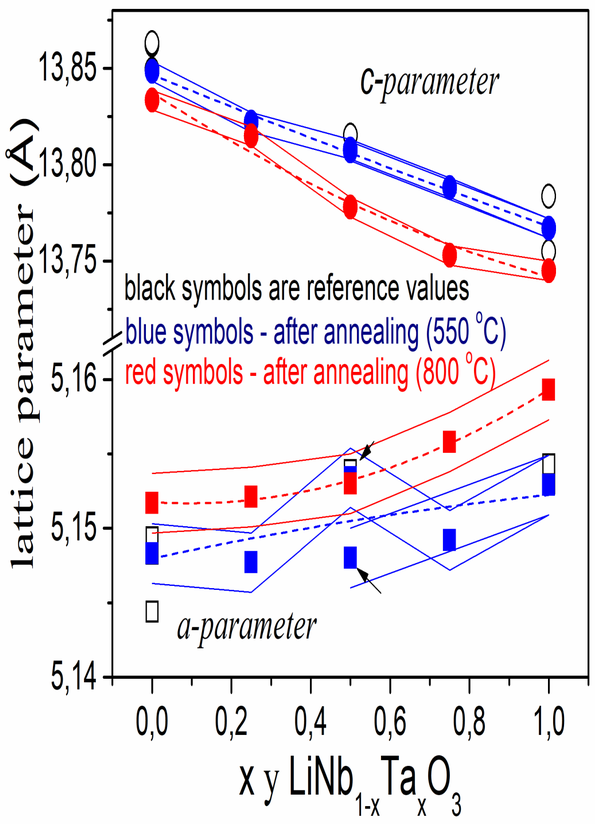


After MChT in air at 600 rpm for 15 h

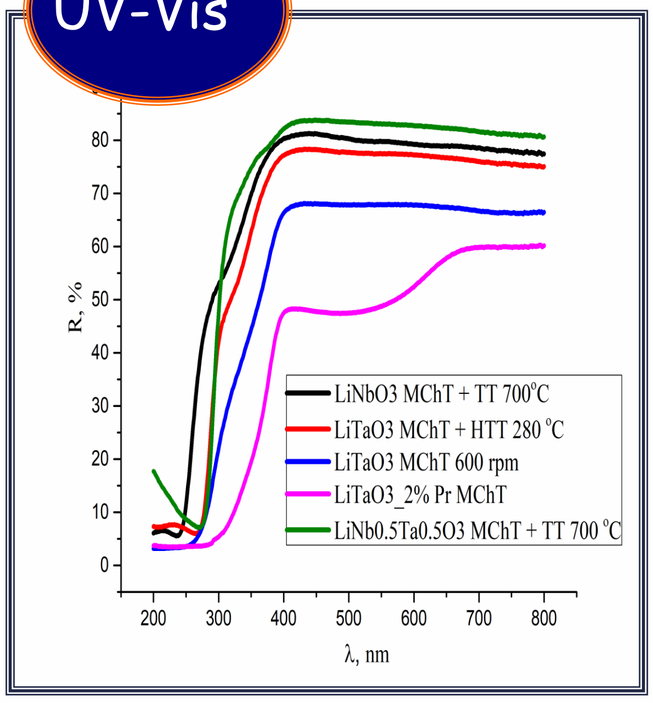


XRD





UV-Vis



Samples	S, m^2/g	E_g, eV	K_d 10^5, s^{-1}	Z, %
$LiNbO_3$ MChT + TT	4	3.23	0.23	55/17
$LiNb_{0.5}Ta_{0.5}O_3$ MChT + TT	3	3.20	0.37	68/19
$LiTaO_3$ MChT	9	3.06	12.6	**88/45**
$LiTaO_3$ MChT + HTT	16	3.10	14.8	**93/50**
$LiTaO_3$/2% Pr MChT	6	3.02; 1.88	16.9	**97/64**

Kd -the degradation rate constant of safranin T
Z- discoloration/mineralization for 5 hours