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Maser-rays Based on Synchrotron Radiation-Total Reflection X-ray Fluorescence (SR-TXRF)

Abstract:

In 2012, during the experiments performed at LNLS (Brazilian Synchrotron Light Laboratory) based on SRTXRF measurements of Ormosil films containing phosphotungstates ($[\text{PW}_{12}\text{O}_{40}]^{3-}$) was observed an image that could be interpreted as the result of the transition from the incident X-ray beam (packets of photons) to a continuous light beam (set of continuous waves). A hypothesis could be based on a summation of small local crystalline domains, resulting in a "continuous beam". Differently of the case of LASER beam, the excitation by synchrotron radiation could generate not only excitation but also ionization of a polyatomic/poly-molecular systems (indeed considering the whole sample), instead of monoatomic system. Thus, the presence of individual MASER (Molecular Amplification by Stimulated Emission of Radiation) beam generated by SR-TXRF could be considered. A MASER produces coherent electromagnetic waves through amplification by stimulated emission (process based on that was argued by Albert Einstein (1916-1917)). In lower ranges of energies than the corresponding to X-rays of electromagnetic spectrum like the Ultraviolet region, the Phosphotungstates molecules exhibit very interesting phenomenon as the photocromism. This phenomenon occurs when the molecules mentioned above are irradiated with ultraviolet light, which brings these molecules to an excited electronic state. The reduced phosphotungstate obtained ($[\text{PW}_{12}\text{O}_{40}]^{4-}$) exhibit a bluish color, being called heteropolyblue. This bluish color disappears in the presence of oxygen. The discoloration time depends on time irradiation of the sample, or on the composition/thickness of the film. It is also possible found photoluminescence in the Phosphotungstates, which is due to the multiples multielectronic collisions.

Biography

Orlando Elguera studied Chemical Engineering at the National University of Engineering (Lima-Peru) with Master's studies in Chemistry Sciences at the National University of Engineering (Lima-Peru), and with Doctorate of Science with Major in Analytical and Inorganic Chemistry at the University of São Paulo (São Paulo-Brazil). He performed as Analyst of the Laboratory of samples of Geochemical Exploration and Inorganic Compounds at SGS del Perú S.A.C (almost 5 years). He has experience in the following method of analysis: Atomic Absorption Spectrometry, Inductively Coupled Plasma Optical Emission- Mass Spectrometry and X-ray Fluorescence. He has published 11 research articles in journals.