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Determination of Amorphous Precursors and Their Effects on the Crystallinity of TiO_2 Thin Films Deposited by Pulsed Laser Deposition[1]

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— TiO_2 is a versatile wide bandgap transparent semiconducting oxide with four well known polymorphs; anatase, rutile, brookite and TiO_2 (B). The crystalline polymorphs of TiO_2 usually require high temperature processes, such as annealing, to form from an amorphous precursor. These crystal structures are also desired for many industrial applications mainly for their photocatalytic activity, such as degradation of organic wastes. Our research aims to understand the formation behavior of these metastable polymorphs of TiO_2 as related to the precursor structure. In this study, TiO_2 thin films are deposited at room temperature on fused silica substrates by pulsed laser deposition under different oxygen pressures. Microstructural properties of the films are investigated by XRD, Raman spectroscopy, SEM, XPS, and optical transmission and reflection spectroscopy. We expect the results to shed light on the nature of polymorphic transitions.

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