

# **Synthesis and characterization of TiO<sub>2</sub> nanoparticles by ball milling process: the influence of process time on the structural, optical, and morphological properties.**

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## **Abstract**

Synthesis of nanomaterials by a simple, low cost and in high yield has been a great challenge since the very early development of nanoscience, TiO<sub>2</sub> nanoparticles is one of the most used metal oxides in the global nanotechnology market. In this work three different particle sizes of TiO<sub>2</sub> nanoparticles were obtained by high energy ball milling which was performed in air using a planetary ball mill (FRITISH PULVERISETTE 7 Premium line). The starting materials were commercial TiO<sub>2</sub> powder (Sigma– Aldrich, 99.9% purity), which were milled for 1hr and 3hr at 200 r/min, The mixture ratio of steel balls and powders was 20:1 by weight percent. The obtained nanoparticles were later analyzed by using X-ray diffraction (*XRD*), Fourier transform infrared spectroscopy (*FTIR*), and Scanning electron microscopy (*SEM*).

**Keywords:** TiO<sub>2</sub> nanoparticles; high energy ball milling; characterization, nanotechnology.