One Step Mechanochemical Synthesis of ZnO Nanoparticles as Perovskite Substrate

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Zinc-oxide is one of the most researched materials with photocatalytic properties today. As a result, many research groups are involved in its production and learning about its properties. In our case, ZnO nanoparticles were prepared via mechanochemical process in one step. In many processes, $ZnCO_3$ is prepared from $ZnCl_2$ and then converted to ZnO by heat treatment. For preparation a planetary ball mill type Fritsch Pulverisette-6 was used with different materials milling drum.

During grinding, ZnO conversion was monitored by continuous sampling and X-ray diffraction (XRD) measurements. As a result, with the settings we used, it took an average of 3 hours for almost 100% conversion of ZnO. During the production we successfully used the GTM-II, gas temperature and temperature measuring system. It is able to measure the pressure and temperature data in the grinding vessel during grinding, thus the pressure value for 100% conversion becomes predeterminable. This significantly can reduce the time that spent optimizing the production of each material, since in the absence of a GTM head, we need a different analytical tool (exp.: XRD) to determine the state of conversion. Thus we were able to improve the knowledge relative to the kinetic of mechanochemical reactions and decrease the time requirement of the synthesis optimization process.

The ZnO samples were also heat treated after milling and tested for their effect on their catalytic activity against coumarin. The products were characterized by transmission electron microscopy, nitrogen adsorption surface determination and photocatalytic measurement.

Keywords: ZnO, mechanochemical, nanomaterial.

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