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Deposition of FTO thin films on large area glass substrates by conventional and ultrasonic spray pyrolysis method

Fluorine doped tin dioxide (FTO) thin films were produced via conventional spray pyrolysis and ultrasonic spray pyrolysis (USP) methods on large area glass substrates using alcohol based solutions. The prepared films were compared in terms of crystal structure, morphology, surface roughness, visible light transmittance and electronic properties. Upon investigation of the grain structures and morphologies, the films prepared using ultrasonic spray method provided relatively larger grains and due to this condition, carrier mobilities of these films exhibited slightly higher values. Dye sensitized solar cells (DSSC) and 10x10 cm modules were prepared using commercially available and USP deposited FTO/Glass substrates and solar performances were compared. It is observed that there exists no remarkable efficiency difference for both cells and modules where module efficiency of the USP deposited FTO glass substrates is 3.06% compared to commercial substrate giving 2.85% under identical conditions. We demonstrated that USP deposition is a low cost and versatile method of depositing commercial quality FTO thin films on large substrates employed in large area dye sensitized solar modules or other thin film technologies.