Chettat Yassine, J Material Sci Eng 2016, 5:4(Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.041

Simultaneous DTA-TGA i8nvestigation of thermal behaviour of photovoltaic solar crucible silicon nitride (Si_3N_4) coating material at high temperatures

Chettat Yassine
CRTSE, Algeria

Background: Silicon Nitride (Si_3N_4) is widely used in numerous applications due to their unique fascinating properties such as high refractoriness, good thermal shock resistance, thermal stability, chemical inertness, resistance to corrosion, and its good oxidation resistance at high temperature. Among them photovoltaic industry where silicon ingot for solar cells manufacturing is crystallized in fused solar silica crucibles lined with thick film of Si_3N_4 protective coating. The raw Si_3N_4 coating layer is heated very slowly at atmospheric air until 1100°C, after that it is sintered at this temperature point during three hours to improve its scratch resistance prior to loading the solar grade silicon feedstock in the silica crucible for crystallization. However, such thermal treatment could cause significant oxidation of the Si_3N_4 coating leading to an increase in oxygen contamination of the silicon ingot. Simultaneous TGA-DTA thermal analyzer type NETZSCH STA 409 PC/PG was used to investigate the intensity of thermal oxidation in air (stability) of higher purity raw Si_3N_4 powder for solar silica crucible coating preparation at 20°C-1450°C range. The measured TGA/DTA and DTA derivative (DDTA) heat signals of debinded 95% α-Si_3N_4 green body versus temperature showed an exothermal step between 494.3°C and 544.6°C. At 814.0°C another exothermal effect starts. They showed also that Si_3N_4 starts oxidizing at 800°C. However, its intense oxidation starts around 950°C where an important increase in the mass of the sample is observed. These results clearly demonstrate how much impurities can influence the thermal behaviour of the Si_3N_4 material, and that it is unstable above 950°C which could explain the silicon ingot intense contamination by oxygen.

Biography

Chettat Yassine is a Researcher in the field of Photovoltaic Energy in CRTSE, Algeria. He is responsible for the Rheology team. He completed his studies in Crystallography with Master's degree from Ceramics Laboratory of Constantine University. Currently, he is a PhD student at Mhamed Bougara University, Boumerdes. He is working on a project of R&D on ultra-pur Si_3N_4 coating systems for solar silica crucible for directional solidification of multicrystalline silicon for photovoltaic applications. He has presented 11 presentations in reputed international conferences among which five are Europeans Photovoltaics Solar Energy Conferences and Exhibition. Three papers are under preparation for publication in reputed international scientific journals and one patent is under development for industrial application.

coatings2007@hotmail.fr

Notes: