

Abstract Submitted
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Single Element Silicon Quasicrystal on Glass ABDUL MIDDYA, Silicon Solar, Inc., PROF. KARTIK GHOSH, PHYSICS, MATERIALS SCIENCE AND ASTRONOMY, MISSOURI STATE UNIVERSITY, MO 65804 COLLABORATION — Quasicrystal is an exotic form of ordering of materials structure found in nature. In this work, we report on formation of single element silicon (Si) quasicrystal, instead of metallic alloys. We found small quantity of quasicrystalline silicon on glass substrate when silicon (Si) and atomic hydrogen (H) atoms in vacuum chamber are allowed to condense on glass substrate maintained at 250°C in hot wire chemical vapor deposition (hot-wire CVD) technique. We observed Penrose tiling at the surface of silicon thin-film as observed by atomic force microscopy (AFM). However, this texturing consists of six-fold symmetry and five-fold symmetry on the surface of spherical ball. We found experimental evidence of the quasi-unit cell, building blocks of quasicrystalline structure. The ordering of quasi-unit cell improves with increasing hydrogen dilution. The Raman transverse optical (TO) peak is observed at 517 cm⁻¹, although the grain size is only 1 to 2 μm. We also found, for the first time, direct experimental evidence of real existence of crystallographic plane in crystal structure. The micrograph of SEM shows grains appear in a very symmetric position, like diffraction spots of ceramics (alloy), we found ceramics-like silicon thin-film.

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