Contribution ID: **489** Type: **Poster**

Conformal deposition of BxC thin films for solid-state neutron detectors

Monday 20 March 2023 16:00 (2 hours)

10B-based solid-state neutron detectors are a viable replacement to 3He detectors. Neutron irradiation of 10B produce charged detectable ions of 4He and 7Li. The detector efficiency using a planar thin film neutron converter configuration is limited by self-absorption of the conversion products in the layer. A 3D configuration, which allows for the conversion products to exit the converter, offers possibility for a higher detection efficiency. The fundamental challenge with a 3D architecture is to deposit conformal films of converter material on high aspect ratio pixelated sensor-chips. In addition, a low temperature process is required since the detector requires ohmic contacts which needs to be coated before converter layer deposition. We report conformal CVD of BxC thin films on sensor-chip substrates with 10:1 aspect-ratio morphologies, using triethylboron (TEB, B(C2H5)3) as single source CVD precursor at 450° C deposition temperature. Step coverage (SC) calculated from cross-sectional scanning electron microscopy measurements shows that films were conformal with a SC of 1. Quantitative analysis using time-of-flight ERDA reveals that the as-deposited films are B rich carbide material with 82.5 at.% B, 15.6 at.% C and < 2 at.% impurities. Promising neutron detection test results of structured diodes will be presented. By utilizing 10B enriched TEB, this result will open the way for efficient solid state n-detectors incorporating 3D-structured 10B4C converter material.

Author: Mr CHOOLAKKAL, Arun Haridas (Linköping University)

Co-authors: Dr O'NEILL, George (University of Bergen, Norway); Dr HÖGBERG, Hans (Linköping University); Prof. PEDERSEN, Henrik (Linköping University); Prof. BIRCH, Jens (Linköping University); Dr POVOLI, Marco (SINTEF MiNaLab, Norway)

Presenter: Mr CHOOLAKKAL, Arun Haridas (Linköping University)

Session Classification: Poster Session MONDAY

Track Classification: Neutron Instrumentation, Optics, Sample Environment, Detectors, and Software