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# Phase identification and microstructure of CoSn<sub>n</sub> intermetallics

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## Abstract

Intermetallic phases frequently disclose degrees of structural order and/or disorder across distinct length scales and dimensionalities. Generally, these phases adhere to a fundamental structural principle, related to the content-ratio of the atomic species, which may be altered to achieve varying levels of long-range order, leading to the formation of superstructures or polytypes. Within the binary Co-Sn system several structural interrelated CoSn<sub>n</sub> phases form. Consecutive layered phase sequences were produced from the reaction of electrodeposited tin coatings on cobalt substrates at different temperatures to resemble vertical sections in the tin rich region of the binary phase diagram. Based on profound X-ray data analysis the individual crystal structure of the observed intermetallics and defined stacking sequences of the Co and Sn layers were resolved. Especially in CoSn<sub>3</sub> pronounced stacking faulting was observed giving rise to a continuous transition between different polytypes. Critical differentiation of the phases and the polytypes was achieved using conventional Hough-based EBSD and Spherical Indexing on the local scale. Thereby, the growth texture and resulting orientation relationship between the specific intermetallic phases were resolved. The actual stacking fault arrangement was revealed by TEM investigations. The collective outcomes form a thorough microstructural description of the strongly interrelated CoSn<sub>n</sub> phases.

**Keywords:** intermetallics, EBSD, XRD, superstructure, polytypes

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