# ELECTRON BACKSCATTER DIFFRACTION

Adam J. Schwartz[1] and Joseph R. Michael[2]

[1]Lawrence Livermore National Laboratory, Chemistry & Materials Science Directorate, L-355,
P.O. Box 808, Livermore, CA 94550 USA

[2]Sandia National Laboratories
P.O. Box 5800, MS 0886
Albuquerque, NM 87185

Crystallographic texture or preferred orientation has long been known to strongly influence material properties. Historically, the means of obtaining such texture data has been though the use of x-ray or neutron diffraction for bulk texture measurements, or transmission electron microscopy or electron channeling for local crystallographic information. In recent years, we have seen the emergence of a new characterization technique for probing the microtexture of materials. This advance has come about primarily through the automated indexing of electron backscatter diffraction (EBSD) patterns. The first commercially available system was introduced in 1994, and since then the growth of sales worldwide has been dramatic. This has accompanied widening applicability in materials science problems such as microtexture, phase identification, grain boundary character distribution, deformation microstructures, etc. and is evidence that this technique can, in some cases, replace more time-consuming transmission electron microscope (TEM) or x-ray diffraction investigations. The benefits lie in the fact that the spatial resolution on new field emission scanning electron microscopes (SEM) can approach 50 nm, but spatial extent can be as large a centimeter or greater with a computer controlled stage and montaging of the images. Additional benefits include the relative ease and low cost of attaching EBSD hardware to new or existing SEMs.

Electron backscatter diffraction is also known as backscatter Kikuchi diffraction (BKD), or electron backscatter pattern technique (EBSP). Commercial names for the automation include Orientation Imaging Microscopy (OIM™) and Automated Crystal Orientation Mapping (ACOM). Its strength lies in the ability to use existing SEMs, the relative ease of sample preparation, the relatively low cost relative to other techniques, and the wide range in length scales available for examination. The primary function is to provide crystallographic data for volumes of material on the order of 50 nm x 200 nm x 200 nm (0.002 $\mu m^3$) with an accuracy of approximately one degree. This information is now routinely being applied to study metals and alloys as well as ceramics and superconductors.

The purpose of this paper is to provide the fundamental basis for EBSD; briefly cover the crystallography required for application; discuss the state of the art hardware and software that is currently available; and lastly, discuss specific applications of the technique.

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