Properties of modern scintillators compared by nuclear and electron microscopy methods

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In recent decades, single crystalline scintillators have proven their potential for use in standard and high-end electron microscopes. They offer high frequency operation, low noise and extremely good resistance to radiation damage. The market share of classical BSE and SE detectors is of about 80% and 30% respectively. For a long time, the single-crystalline scintillators used in electron microscopy were based almost uniquely on cerium doped yttrium aluminates: yttrium aluminium garnet (YAG) and yttrium aluminium perovskite (YAP) [1]. Up to now, the “read out” of the scintillator in scanning electron microscopy (SEM) is done using a photomultiplier tube (PMT) typically with a bialcali photocathode. Unfortunately, scintillation emission of YAG:Ce and YAP:Ce crystals is shifted quite a lot towards red and blue respectively compared with the spectral sensitivity of the PMT.

This contribution discusses and compares properties of new coming scintillation materials like CRY018 and others. New materials offer relative increase of detected signal by a factor of about two compared to classical YAG:Ce or YAP:Ce materials. The detection efficiency is studied simultaneously by nuclear methods (multichannel analysator) and by measurements in an electron flux in an SEM. State of the art performance of single crystal detectors for electron microscopy will be presented.

1. R. Autrata et al., Scanning Electron Microsc. **11** (1983) p489.

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