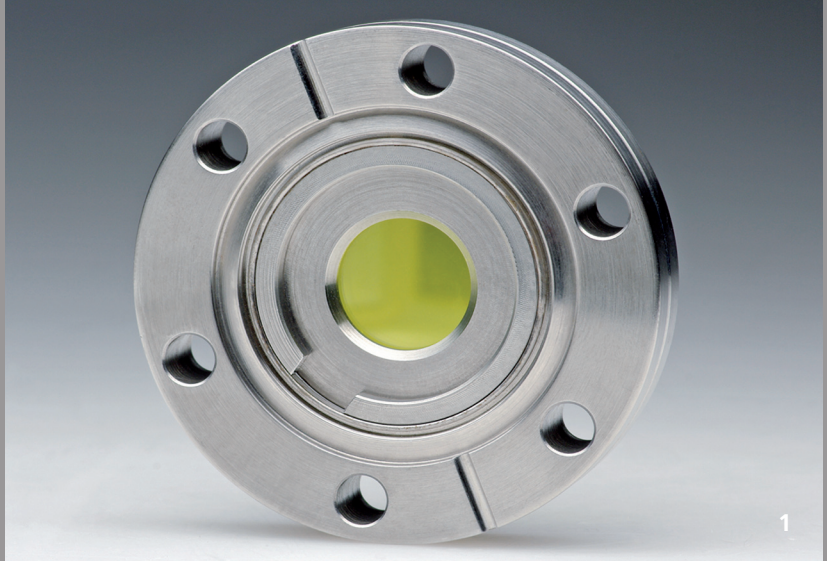

INVESTIGATIONS OF FLUORESCENT SUBSTANCES FOR THE EUV SPECTRAL RANGE

Task

Fluorescent substances are commonly used in the extreme ultraviolet (EUV) spectral range as imaging components, which convert short-wavelength radiation into visible light. A camera can then be used to detect this reemitted light in the visible spectral range. The choice of an appropriate fluorescent substance for a particular application depends upon its properties regarding its conversion efficiency, self-absorption and degradation. These properties have hardly been examined in EUV before. The work presented here aims to investigate different fluorescent materials as to their efficiency and self-absorption.

Method

The fluorescent materials examined were illuminated with EUV radiation and the converted light was measured in the transmission direction with a photodiode. A dose monitor in the EUV beam path measures the intensity of the incident light at the same time. From the ratio of incident to converted light, the conversion efficiency can be determined. Separately, the self-absorption is measured in a spectrometer, in which each fluorescent substance is radiated by its peak emission wavelength and the transmission detected.

Result

Five scintillators and seven phosphors were examined as to their conversion efficiency and self-absorption. The scintillators revealed principally lower efficiencies and lower self-absorptions than the phosphors. The most efficient phosphor is P43 with an efficiency of approx. 16 percent. In comparison, the most efficient scintillator, YAG:Ce achieved an efficiency of 1.5 percent. When the sample thickness is decreased and thus that of the self-absorption, a higher efficiency can be reached: 25 percent for P43 as well as 3.5 percent for YAG:Ce.

Applications

The results can be used to improve the manufacture of fluorescent coatings on cameras for the detection of EUV radiation. By making a significant improvement to the properties of such a camera, a manufacturer can create a cost-efficient alternative to the current standardized back-illuminated CCD cameras.

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1 Scintillator crystal YAG:Ce in a holder suitable for use in a vacuum.