Invited Talk
Date: Sept. 1 (Friday), 2023
Time: 10:00 AM - 11:00 AM
Room: 238

Transparent ceramic materials: enabling new and multifunctional optical and photonic applications

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ABSTRACT

Transparent ceramics are highly promising materials, with some properties exceeding that of single crystal and amorphous materials, for potential utilizations in a wide range of defense, optical and photonic applications; most notably being laser, scintillator, armor protection, and optoelectronic applications. To develop high quality transparent ceramic materials for such applications, it is essential to study the fundamental science aspects involved in the synthesis and processing of the materials, in order to achieve the required transparency and microstructures. The scientific goal of such fundamental studies is to understand the mechanisms that control optical scattering and chemical defect behavior in optical materials, in order to minimize material defects that cause light absorption and scattering. Furthermore, processing transparent optical materials with anisotropic crystal structures presents additional significant challenges, due to the inherent characteristics of optical anisotropy in polycrystals. An effort is placed on understanding the effects of processing technique on birefringence behavior in transparent photonic ceramics. Additionally, digital processing through additive manufacturing has great potential as a new method for fabricating optical materials.