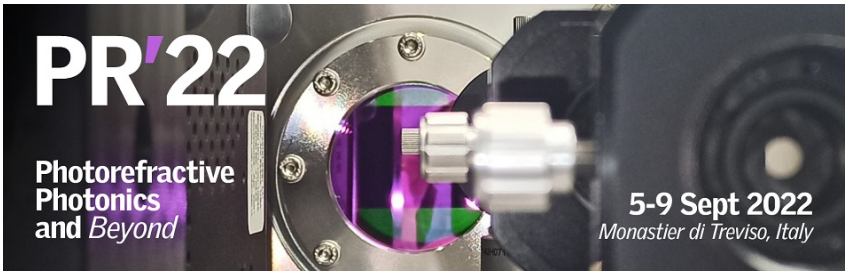

Contribution ID: **50** Type: **Invited Talk**

Polar oxide nanomaterials - an emerging playground in photophysics

Friday, 9 September 2022 08:30 (35 minutes)

The manifold photophysical properties of polar oxide crystals have driven the research field of photorefraction for decades to a large extent. With the availability of nanoscale polar oxide model systems, the question arises to what extent the acquired knowledge remains applicable for crystals with dimensions on length scales of micro- and nanometres, i.e. in the order of magnitude of the photovoltaic transport length. A number of phenomena can be predicted from the application of knowledge from nanosciences, such as the disappearance of second-order photophysical effects with the collapse of spontaneous polarization at crystallite sizes on the sub 5-nm length scale (size effect).

However, there are also phenomena that so far have no analogue in other model systems, such as the self-localization of charge carriers with strong coupling as small polarons and their hopping-like transport in strongly confined structures. Questions about the rising influence of the nanocrystals'surface on the self-localization or the lifetime of polarons as a function of the crystallite size have not been studied, nor have the properties of the photogalvanic effect - up to the photorefractive effect - in nano- and microstructured polar oxide material systems.

The talk gives an overview of: (1) selected examples of progress in the synthesis of polar oxide nanomaterials of the last years, (2) specifically developed methods for nonlinear optical characterization of respective samples, (3) phenomena unambiguously resulting from the effect of length scale reduction and (4) perspective application areas.

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Session Classification: Nonlinear light-matter interaction and applications

Track Classification: Materials