Poster Presentation

MS23.P04

Pyroelectric Crystals: Structure, Properties and Applications

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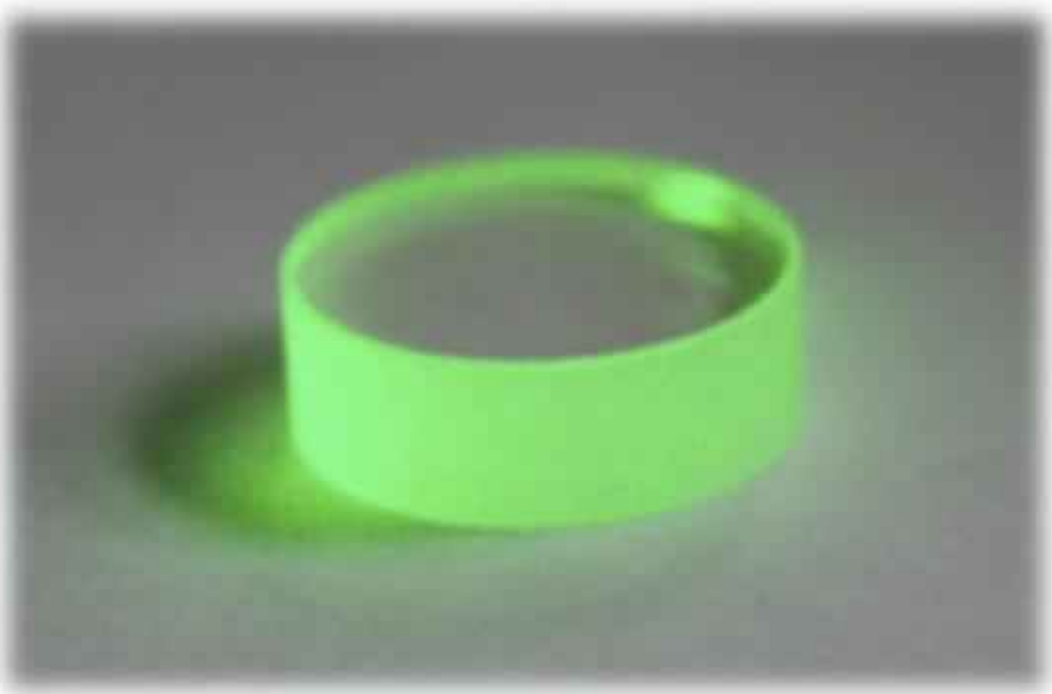
As defined by the IUCr, a material is a crystal if it has essentially a sharp diffraction pattern. Crystalline materials are wide spread in our today's life. More than 98 % of the solid fraction of the earth comprises crystalline matter, most of which are oxides. Single-crystals in particular are the basis for many applications – lasers, LEDs, sensors, etc. – and play an important role in fundamental research – for instance in materials science. The discipline that elucidates the impact of the crystal structure on the physical properties of particularly crystalline materials – crystallography – is of specific importance for the design of new materials. Moreover, crystallography can be utilized to establish new concepts and thus may contribute solving today's challenges in science and technology. Several technologies exist for the conversion of electric energy into, e. g. heat, light and motion or vice versa. In this context, this work highlights an approach based on the crystal coupling phenomenon pyroelectricity that can be adopted for energy conversion concepts. By means of pyroelectric crystals, waste heat can be converted into surface charges, which provide a manifold of applications. First, a comprehensive overview of more than 3000 known pyroelectric materials is given, including a categorization in terms of properties and crystallographic characteristics. In order to provide a high pyroelectric coefficient at certain temperatures, taking economic, ecologic and further material properties into account, promising materials are suggested and verified by a computer controlled thermal/electrical stimulation set-up. Several possible applications as, for instance, disinfection [1], and anti-icing are presented. Finally, an approach to convert waste heat into chemical energy, i. e. the generation of hydrogen, is introduced.

[1] *E. Gutmann, A. Benke, et al., J. Phys. Chem. C, 2013, 116, 5383-5393*



Keywords: pyroelctricity, energy conversion