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Polarization activated by Jahn-Teller distortions in perovskites and vice versa¹

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Although prototypical ferroelectrics such as BaTiO_3 and PbTiO_3 belong to the family of ABO_3 perovskite compounds, relatively few perovskite oxides are in fact ferroelectrics. Some years ago, a new type of improper ferroelectricity – nowadays referred to as “hybrid improper ferroelectricity – has been discovered in layered perovskites, highlighting an alternative mechanism to achieve ferroelectricity in this family of compounds. In hybrid improper ferroelectrics, the polarization is activated by the appearance of a combination of two independent non-polar atomic distortions. So far, most efforts have focused on systems in which these non-polar distortions are anti-ferrodistortive rotation motions of the oxygen cages. In this talk, I will show that, in some systems, polarization can alternatively be activated by non-polar Jahn-Teller distortions or, vice versa, Jahn-Teller distortions can be activated by the polarization. This will be exemplified both in layered and bulk perovskites. In these systems, the intimate coupling between polarization and Jahn-Teller distortions is not only of academic interest but reveals also a promising pathway to achieve electric control of the electronic properties.

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