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Optical Probes of Growing Crystals: Elucidating Surface Chemistry and ‘Sensing’ Polar Axes.

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Probe molecules have long been a mainstay of biochemists eager to illuminate specific non-covalent interactions. Crystal growth from solution is also controlled by specific non-covalent interactions, but optical probes have not been used likewise, as close packed crystals generally do not have the space to accommodate such labels. However, it is now well established that crystal growth far from equilibrium can drive mixed crystal formation even when guest molecules are much larger than the host molecules or ions. Here, we show how dyes respond to the properties of facets of growing crystals. 3,6-diaminoacridine exhibits *tricolore* luminescence in response to the charges of surfaces of potassium biphthalate while at the same time establishing the absolute sense of the polar crystallographic axis, while the common pH indicator methyl red probes the ‘acidity’ of surfaces of phthalic acid.