

## SEEING ESSENTIAL STEPS IN CATALYSIS WITH ULTRAFAST X-RAYS

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Conceptually attractive but practically hard, bond activation in inert molecules is difficult because the bonds are so stable. Here we show how ultrafast X-ray spectroscopy helps understanding the activation of C-H bonds down to the level of orbitals. With optical light pulses, we trigger activation reactions and with short X-ray pulses we follow them in space and time. We see C-H bonds attaching to a catalytically active metal site and we see them breaking because of that attachment. Understanding bond activation at the orbital level, we hope, helps in the design of new bond activation catalysts.

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