Atomic resolution scanning tunneling microscopy images help elucidate a possible role of catalytic cesium in important industrial reactions on silver

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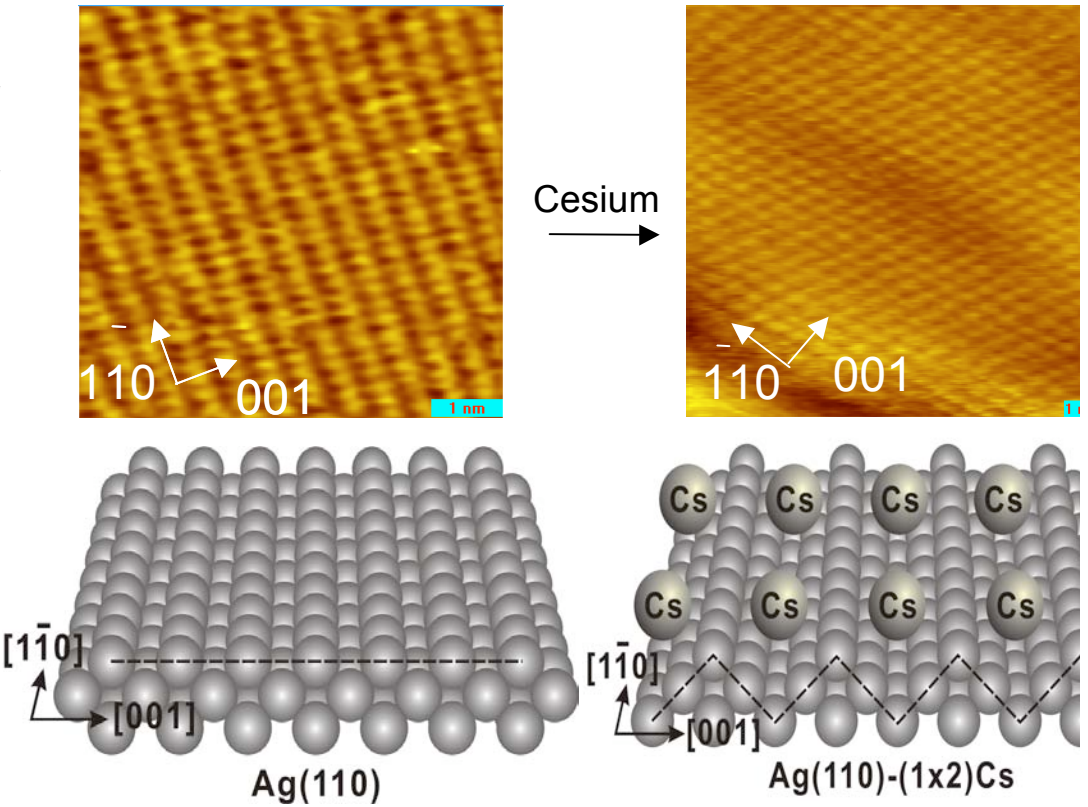
Silver catalyzed oxidation reactions are very important in a variety of chemical industries, including the synthesis of long chains of molecules known as polymers, rocket fuel, and pharmaceuticals. When a small amount of cesium is added to the reaction, more of the desired product is formed, improving the selectivity. Understanding the mechanism behind cesium's promotive effect could allow a further optimization of the reaction, saving large amounts of money and preventing the production of waste products. Scanning tunneling microscope images of silver atoms have shown that the addition of cesium to a specific arrangement of silver atoms, Ag(110), reconstructs the surface into microscopic facets of a different structure, Ag(111). It has previously been demonstrated that the oxidation reaction on Ag(111) primarily produces the desired product, while reactions on Ag(110) do not. Each of these structures can be found in the silver particles used for the industrial reaction, so the structural change of Ag(110) to Ag(111) provides a possible explanation for the increased selectivity due to cesium on silver catalyzed oxidation.



Left: Scanning tunneling microscope image of silver atoms ir an Ag(110) facet + model below.
Right: Image of silver atoms when cesium is added to the Ag(110) facet, reconstructing into Ag(111) facets on the surfa + model below.
Dotted lines show the crystal facets.

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