

## Question #72487, Chemistry / Inorganic Chemistry

What is inert pair effect?

**Answer:**

The inert pair effect is the tendency of the electrons in the outermost atomic s orbital to remain unionized or unshared in compounds of post-transition metals. The inert-pair effect refers to the empirical observation that the heavier elements of groups 13–17 often have oxidation states that are lower by 2 than the maximum predicted for their group. For example, although an oxidation state of +3 is common for group 13 elements, the heaviest element in Group 13, thallium (Tl), is more likely to form compounds in which it has a +1 oxidation state. In moving down a group in the p-block, increasing ionization energies and decreasing bond strengths result in an inert-pair effect.

The chemical inertness of the s electrons in the lower oxidation state is not always married to steric inertness (where steric inertness means that the presence of the s electron lone pair has little or no influence on the geometry of the molecule or crystal). A simple example of steric activity is that of  $\text{SnCl}_2$  which is bent in accordance with VSEPR. Some examples where the lone pair appears to be inactive are bismuth(III) iodide,  $\text{BiI}_3$ , and the  $\text{BiI}_6^{3-}$  anion. In both of these the central Bi atom is octahedrally coordinated with little or no distortion, in contravention to VSEPR theory.

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