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ANOMALOUS NATURE OF LITHIUM

On descending any group of S- or P-block elements of the periodic table, There is a general decrease in electronegativity or increase in electropositivity. The difference in electronegativity between the first and the second elements of each group is much greater than that between any two successive elements. This is reflected in the properties of the elements. Thus, not only is the first element more electronegative the other elements of the group, but it is much more electronegative than expected by simple extrapolations. The differences, therefore, between the first and rest of the Group 1 metals are those between a less electropositive metal and a more electropositive metal.

- Due to the very small size of lithium, the metallic bonding between the atoms in the metallic lattice is very strong giving rise to strong cohesive forces. This is shown in its relatively higher melting and boiling points, hardness and homonuclear bond energy. The relatively higher attraction of lithium for its outer electron results in its relatively higher electronegativity, ionisation energy, hydration energy, electron affinity and of course smaller atomic radii relative to the other homologues.

Similar anomalies are also found in the chemical properties but the differences appear greater.

(1) Lithium salts of large polarisable anions are thermally less stable than those of other alkali metals, e.g lithium carbonate decomposes at 950K, whereas no decomposition of sodium carbonate takes place below 1050K.

ii) Lithium forms no solid bicarbonate, trisodide and superoxide, as these are unstable at room temperature, whereas those of other alkali metals require a higher temperature to effect their decomposition.

iii) Lithium salts of anions of high charge density are less soluble than those of other alkali metals. The halides of lithium are more covalent than the other halides and are more soluble in organic solvents.

iv) Lithium forms stable salts with anions of high charge density owing to their high lattice energy. e.g in air, lithium forms the normal oxide, whereas the others form higher oxides. Lithium reacts with nitrogen to form nitride, Li_3N, the others do not react. Lithium hydride is more stable than the other hydrides and lithium carbide is formed more easily with acetylene.

v) Lithium reacts slowly with water

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