Change of electron capture nuclear decay rate in different media and under compression

Amlan Ray

Variable Energy Cyclotron Center
1/AF, Bidhan Nagar
Kolkata – 700064
India

The study of electron capture nuclear decay rate in different media and under compression is interesting and has implications in many areas. It was known for a long time that the electron capture decay rate of ^{7}Be was slightly different for different ^{7}Be compounds. Recently relatively larger effects (~1%) were seen by comparing the decay rates of ^{7}Be implanted in a medium of high electron affinity versus low electron affinity. These results have implications for the calculation of ^{8}B solar neutrino flux.

The possibility of increasing the electron capture nuclear decay rate by compressing a radioactive atom is also very interesting and was observed earlier by compressing ^{7}BeO and more recently by compressing $^{7}Be(OH)_2$ gel. The eigenstate energies of an atom increase under spatial confinement and this effect might also increase the electron density of the orbital electrons at the nucleus thus increasing the decay rate of an electron capturing radioactive nucleus. Recent observations regarding the increase of the electron capture decay rates of ^{109}In and ^{110}Sn implanted in the small Au lattice versus large Pb lattice would be discussed.