A Multi-Parameter Optimization technique considering temporal and spatial variation in nuclear response of materials in Fusion devices

- A method to optimize the elemental and isotopic composition of a material placed in a spatially and temporally varying neutron flux has been developed.
- The optimized composition calculated using the scheme ensures least radiological responses like activity, contact dose rate, gas production, radwaste etc. for a specific irradiation scenario.
- A contributing factor called ECF for elements and ICF for isotopes is defined and calculated for each material and a specific neutron flux.
- The material composition is optimized based on ECF or ICF within a closed range provided by the user. The optimization scheme encompass the effects of spatially and temporally varying neutron flux in a reactor like a scenario.
- The developed algorithm is incorporated into multipoint activation code, ACTYS-1-GO.
- The usefulness of the scheme is demonstrated by taking Stainless steel (SS316) used in the ITER shutdown benchmark study as an example problem. For SS316 the optimized composition calculated by ACTYS-1-GO, yields all radiological quantities reduced by more than 99% after 50 years of shutdown.