Thin layer activation (TLA) technique to study the surface loss of materials using high energy ion beams from cyclotron at VECC

❖ **TLA technique is a powerful nuclear technique to measure the surface loss of materials in the micrometer to nanometer range.**
❖ **Material loss may be by surface wear, corrosion or erosion due to mechanical motion, chemical reaction or high voltage electrical / laser / plasma induced discharges, respectively.**

General methodology :
❖ **Ion beam : Light ion beam like proton, d (10 – 30 MeV), alpha (30 – 50 MeV) and heavy ion ^{16}O (50 – 110 MeV) – used to generate thin layer of activity**
❖ **Penetration depth : 10 – 200 μm depending on energy of ion beam**
❖ **Isotope : It should have long half life (several days to few months) and convenient γ-rays and good cross section to produce with high yield**
❖ **Standard calibration curve to be generated by stacked foil activation with thin metallic foils (μm) using same energy of projectile**

Surface erosion of brass electrode under high voltage electrical spark discharge

❖ **TLA technique can be applied in any metal alloy surface. It may be applied also in ceramic and synthetic polymer materials by generating ultra thin layer of activity by recoil implantation technique.**
❖ **TLA technique can be applied to measure surface loss of materials in high technology areas like automobile, nuclear reactor, aeronautic and space industries, power plants, fusion reactor. It has been found to highly potential to measure the surface loss of materials in orthopaedic hip joints with artificial implants**
❖ **TLA technique applied at VECC using ion beams from VEC cyclotron : 1. Surface wear in piston ring and cylinder housing of automobiles, 2. Surface wear in zircaloy coolant channel and pin in reactor, 3. Surface erosion in brass electrode under high voltage electrical spark discharge used in RF circuit of cyclotron, 4. Surface erosion in zircaloy material by laser ablation process during decontamination of adhered mixed oxide fuel particulates from zircaloy clad surface.**