# Evaporation residue exciation function for $^{18}$O+$^{194}$Pt reaction.

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## Introduction

Study of the survival probability of evaporation residues (ER) formed in heavy ion collisions and the competition of quasifission process [1, 3] in hindering the formation of compound nucleus (CN) have been the topic of extensive theoretical as well as experimental study in recent years. ERs are the unambiguous signatures of CN formation and the knowledge of their survival probability against fission and quasifission are particularly important in producing the superheavy elements (SHE). ERs are the best probe to invesitigate the pre-saddle dissipation process at high excitation energies. We report the ER excitation function measurement for the reaction $^{18}$O+$^{194}$Pt at energies around the Coulomb barrier performed at the 15UD Pelletron accelerator facility of Inter University Accelerator Centre (IUAC), New Delhi.

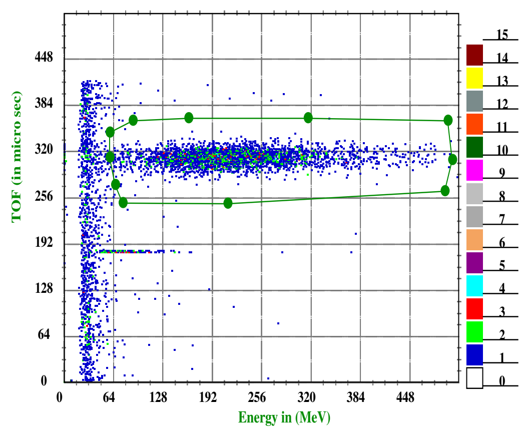


FIG. 1: The time-of-flight versus energy spectrum for $^{18}$O+$^{194}$Pt reaction for 96.1 MeV. The events shown inside the gate are the ERs reaching the focal plane.

## Experimental Details

The experiment was performed using the gas-filled recoil mass separator HYRA [4] at IUAC. Pulsed $^{18}$O beam (TWD with 4 $\mu$s pulse separation) was used to bombard the isotopically enriched target of $^{194}$Pt (270 $\mu$g/cm$^2$ on 15$\mu$g/cm$^2$ thick carbon backing) in the measurement. The measurements were performed at laboratory beam energies (after correcting for the loss in the pressure window foil (660 $\mu$g/cm$^2$ thick carbon foil), carbon

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backing and half thickness of the target) of 77.7, 82.8, 86.9, 92.1, 96.1, 100.2 and 105.3 MeV. Two monitor detectors (silicon) mounted at ± 22.7$^o$ were used for registering the Rutherford events, and were used for normalizing the absolute cross sections. HYRA was operated at 0.15 Torr helium gas pressure through out the experiment. The ERs reaching the focal plane were detected using a large area position sensitive MWPC of active area 2 inch × 5 inch. A TAC spectrum was generated by taking the "start" from the MWPC-anode signal and "stop" from the TWD-signal, and was used to effectively separate the ERs reaching the focal plane from other background particles. Fig. 1 shows the TAC spectrum for 96.1 MeV beam energy. The ERs reaching the focal plane (shown inside the gate) are well separated from other contaminations in energy versus time of flight spectrum.

## Analysis and Results

The total ER cross section is given by

$$\sigma_{ER} = \frac{Y_{ER}}{Y_{mon}}\left(\frac{d\sigma}{d\Omega}\right)_R \Omega_M \frac{1}{\epsilon_{HYRA}} \quad (1)$$

where $\sigma_{ER}$ is the ER cross section in mb, $Y_{ER}$ is the ER yield at the focal plane, $Y_{mon}$ is the yield in the monitor detector, $\epsilon_{HYRA}$ is the HYRA transmission efficiency and $\Omega_M$ is the solid angle subtended by the monitor detector. $\left(\frac{d\sigma}{d\Omega}\right)_R$ is the differential Rutherford scattering cross section in the laboratory system. $^{16}O+^{194}Pt$ reaction [5] was used as the calibration system to obtain the HYRA transmission efficiency, $\epsilon_{HYRA}$. For this, the ER cross section for $^{16}O+^{194}Pt$ was measured for two energies (96.6 and 92.0 MeV). The ER angular distribution for the two reactions were simulated using TERS [6] and were compared within the angular acceptance of HYRA (polar angle of 3.4$^o$ in the present case). The $\epsilon_{HYRA}$ obtained for $^{16}O+^{194}Pt$ reaction is hence normalized to get the transmission efficiency for $^{18}O+^{194}Pt$ reaction [5, 7]. In Fig. 2 we have shown the ER cross section for $^{18}O+^{194}Pt$ reaction in arbitrary units. The analysis of the data is in progress.

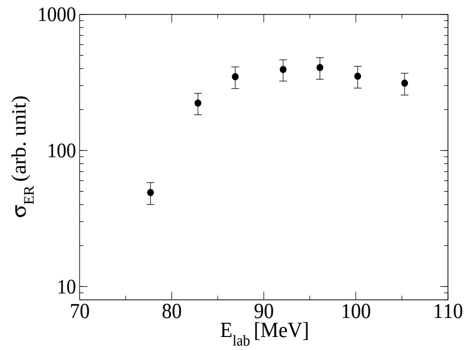


FIG. 2: Experimental ER cross section in arbitrary unit for the reaction $^{18}O+^{194}Pt$.

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