Study of the ^{40}Ar + ^{208}Pb reaction using the ^{40}Ar Piave-ALPI test beam and the Prisma-Clara set-up

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The study of few- and multi-nucleon transfer reactions in the system ^{40}Ar + ^{208}Pb may offer interesting results, also in the comparison with what we obtained in the recent study of ^{40}Ca + ^{208}Pb where clear evidences of simultaneous nucleon pair transfer have been found. Moreover, the case of ^{40}Ar + ^{208}Pb is attractive from the point of view of the possibility of populating neutron-rich nuclei in the sulphur-silicon region with non-negligible cross sections, for nuclear structure studies.

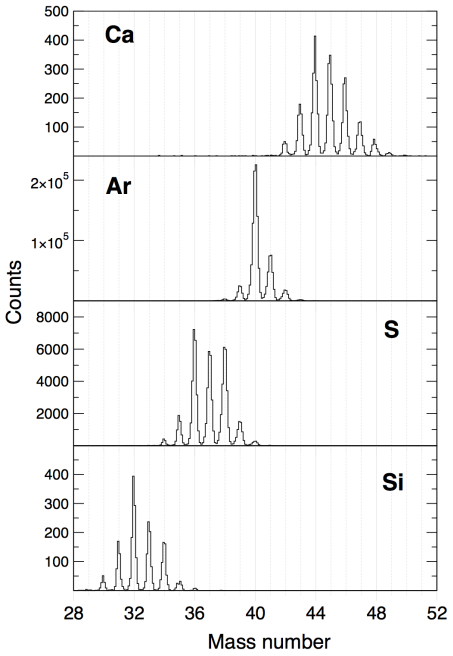

FIG. 1: *Examples of mass spectra measured in the reaction ^{40}Ar + ^{208}Pb.*

A preliminary run was recently performed at the combined PRISMA-CLARA facility, using the ^{40}Ar^{9+} beam produced by the new ECR source - positive ion injector (PIAVE) feeding the ions into the superconductive Linac ALPI for final acceleration. The beam energy on the target was 252 MeV and its intensity was 8 pnA on the average. The beam quality and stability were quite good over the two days of the test experiment; the spot on the target had a nearly spherical shape with about 3 mm diameter. The target was a 300μg/cm^2 evaporation (a 2 mm strip) of enriched ^{208}Pb onto a 15 μg/cm^2 carbon foil. The Prisma spectrometer was placed at θ_{lab}=66^o (around the grazing angle), and the ionization chamber at the focal plane was operated with Freon at a pressure of 30 mbar, with very good energy resolution. The γ-ion coincidence rate was around 300 Hz. These experimental conditions allowed the acquisition of very clean events, and the obtained Z and mass spectra are of a very good quality (see Fig. 1). Fig. 2 shows the mass distributions for several elements. It is seen that many neutron-rich nuclei, like for instance ^{50}Ca, ^{41}S, ^{36}Si, ^{33}Al and ^{29}Mg, are populated by multi-nucleon transfer.

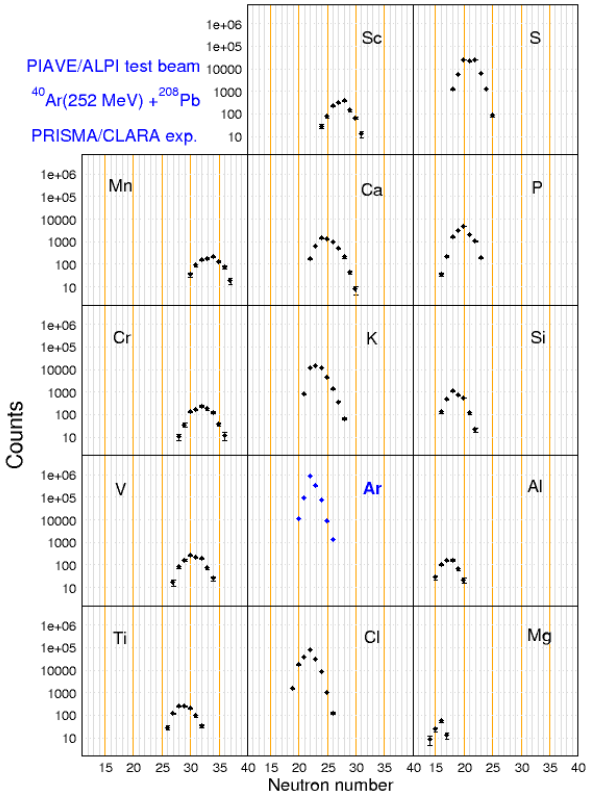

FIG. 2: *Mass distributions for several elements.*