Inside HOLMES experiment: ^{163}Ho metallic target production for the micro-calorimeter absorber

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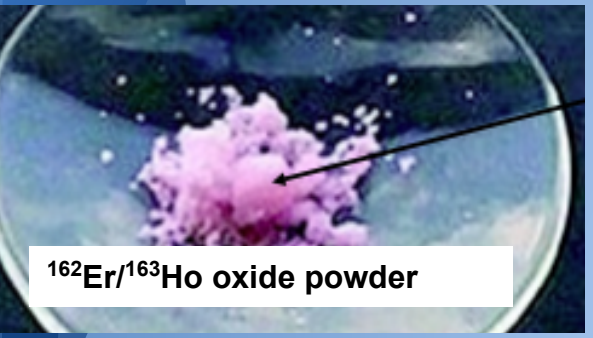
Poster #306

The HOLMES experiment is aimed at directly measuring the electron neutrino mass using the electron capture (EC) decay of ^{163}Ho. HOLMES will deploy a large array of low temperature microcalorimeters with implanted ^{163}Ho nuclei. The resulting mass sensitivity will be as low as 0.4eV.

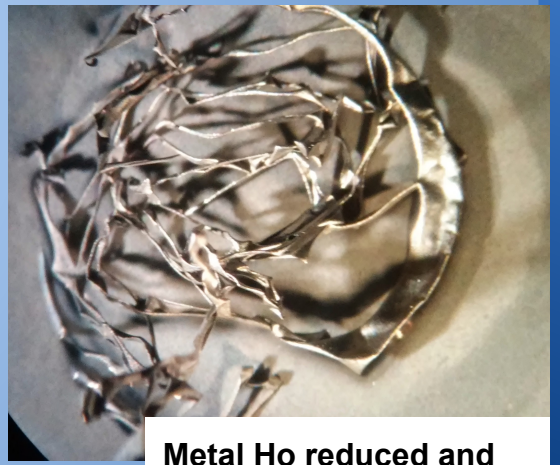
Holmium Reduction Distillation



^{162}Er/^{163}Ho oxide powder

^{163}Ho is not present in nature. One of the easier method for the ^{163}Ho production is neutron irradiation of enriched ^{162}Er samples, which is typically in oxide form therefore the final product is composed mainly by both Ho and Er oxides. Because the presence of oxide Ho would modify the shape of the calorimetric spectrum, it is necessary to purify the Ho sample by means of a reduction and distillation process.

In our laboratory we have proved how it is possible to obtain metal Ho starting from oxide Ho using the reduction distillation technique. Heating a mixture of metal Yttrium and oxide Holmium above the melting point, the oxygen is captured by Yttrium, leaving pure metallic Holmium which is free to evaporate from the mixture.



Metal Ho reduced and distilled from oxide Ho