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The AMoRE project to search for neutrinoless double decay of 100Mo using cryogenic CaMoO4 detectors

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The AMoRE (Advanced Mo-based Rare process Experiment) project is an international experiment to search for neutrinoless double beta decay of 100Mo. The project employs a cryogenic detection method using magnetic calorimeters as sensor and CaMoO4 crystals as absorber in the concept of source equal to detector. It is scheduled to prepare a large scale experiment with 200 kg 40Ca100MoO4 crystals (enriched in 100Mo and depleted in 48Ca) in next 10 years. A sensitivity of the experiment to the effective Majorana neutrino mass is estimated to be on the level of 0.02-0.05 eV. A 10 kg prototype detector is expected to be constructed in 3 years. We will report on the current status and future plan of the AMoRE project. The present R&D demonstrates significant improvements in energy resolution for a phonon detection chain. A similar technique of magnetic calorimeters is also used to measure also light signals from CaMoO4 scintillators. The pulse shape analysis and the signal ratio in the heat and light channels enable an event by event discrimination of alpha events to suppress background caused by trace radioactive contamination of crystal scintillators. The signals from magnetic calorimeters have relatively fast rise time that may increase the efficiency to separate one of the most valuable background sources, namely random coincidence events of two neutrino double beta decay of 100Mo.

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