

High-Quality Lead Tungstate Crystals for PANDA

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There is a strong interest and demand for high quality lead tungstate crystals (PbWO₄, PWO) for electromagnetic (EM) calorimetry. PWO has been implemented into the EM calorimeter of the CMS-ECAL detector at LHC and is required for the completion of the PANDA-EMC in the target spectrometer. In spite of moderate radiation hardness in an environment of high hadron fluences, PWO represents an ideal material for EM-calorimetry on electron accelerators and/or experiments with primarily electromagnetic probes. The compactness, sufficient light yield and various recovery options combined with a moderate price require the availability of mass production. The Czochralski method has been proven to be the optimum growing technology. However, after bankruptcy of the Bogoroditsk Technical Chemical Plant in Russia as the major producer so far, a new manufacturer had to be found. The company CRYTUR (Turnov, Czech Republic) with good experience in the development and production of different types of inorganic oxide crystals has re-started end of 2014 in a common effort the development of lead tungstate for the mass production based on the Czochralski method. An impressive progress of the R&D was achieved since then. The growing technology was optimized to produce full size samples with the quality meeting the PANDA EMC specifications for PWO-II. The presentation will give a detailed progress report on the research program in collaboration with groups at Orsay and JLab. The full size crystals are characterized with respect to optical performance, light yield, kinetics and radiation hardness. The report will give a status on the ongoing pre-production of more than 120 tapered crystals for the barrel section of the PANDA-EMC and compare the achieved quality to the former production at BTCP and prototypes produced at SICCAS.

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