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Development of Novel Inorganic Scintillators for Future High Energy Physics Experiments

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Total absorption electromagnetic calorimeters (ECAL) made of inorganic crystals provide the best energy resolution and detection efficiency for photon and electron measurements, so are the choice for those HEP experiments where high resolution is required. Recent HEP applications are the CMS PWO ECAL [1], the g-2 PbF₂ ECAL [2], the Mu2e CsI ECAL [3] and the CMS LYSO-based barrel timing layer (BTL) detector [4]. Novel crystal detectors are continuously being discovered in academia and in industry. We report recent progress on novel inorganic scintillators of three categories for future HEP experiments at the energy and intensity frontiers. They are (1) bright, fast, radiation hard inorganic scintillators, such as LYSO:Ce crystals and LuAG:Ce ceramics, for an ultra-compact and radiation hard ECAL at the HL-LHC and FCC-hh, (2) ultrafast crystals, such as BaF₂:Y, for an ultrafast calorimeter and a precision time of flight (TOF) detector, and (3) cost-effective inorganic scintillators for a homogeneous hadron calorimeter at a future lepton Higgs factory collider, such as the ILC or FCC-ee.

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