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Coating based radon barriers for future liquid xenon detectors

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Despite overwhelming evidence for dark matter in our universe, its true nature remains a mystery. In the search for direct detection, detectors using liquid xenon are currently leading in sensitivity. However, these experiments are increasingly limited by self-induced backgrounds, particularly the emanation of radon from detector materials. To address this challenge, a novel radon mitigation technique using surface coatings has been investigated. Systematic studies at MPIK have demonstrated that electrochemical plating with a 5 µm copper layer can reduce radon emanation by up to three orders of magnitude. This technique is currently scaled up for vessel-like geometries with a new setup. Furthermore, testing of the coating's performance in a dual-phase xenon detector's gas phase is currently in planning.

Presenter: ARMBRUSTER, Sophie

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