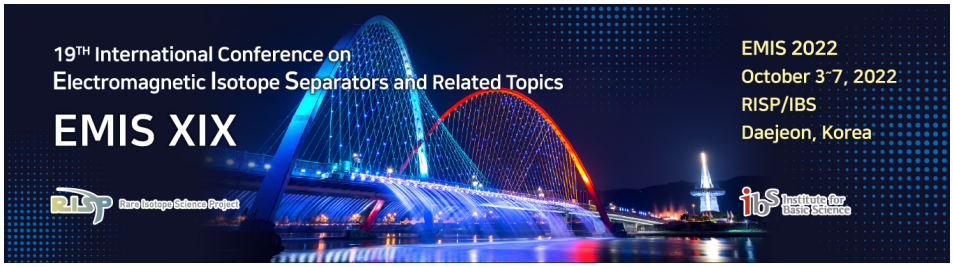

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Development of targets with tailor-made microstructure at CERN-ISOlDE

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At CERN-ISOLDE, among the main technical challenges for the production of radioactive ion beams (RIBs) is the design of target materials for in-target isotope production via nuclear reactions to allow for fast diffusion and effusion of the produced species for delivery to ISOLDE users. This requires a compromise between density and pore structure, while maintaining the required levels of thermal stability to limit sintering and maintain these properties in online separator conditions. Thus, a dedicated program has been recently launched at CERN-ISOLDE to develop target materials with tailor-made microstructure and to study their characteristics with respect to improved isotope release, RIB yield and microstructural stability. Since carbide and oxide targets constitute more than 70% of the operated targets [1], main focus lies on the development of nanosized UCx and LaCx target materials, with increased surface areas, fine pore structure and greater thermal resistance. In addition, this program explores the development of nanosized and highly porous ceramic materials such as ZrO2. Currently, fiber-based structures are occasionally used at CERN-ISOLDE, which are however prone to sintering effects. By exploiting electrospinning[2] and freezecasting techniques[3], nanofiber-based materials with minimized contact points that otherwise foster sintering, and highly porous materials with oriented pore structure for fast effusion paths are developed for optimized target performance. In this contribution, we will give an overview over these development efforts and present first results.

[1] J.P. Ramos, Nucl. Instrum. Meth. B 463 (2020) 201.
[2] U. K¨oster et al., Nucl. Instrum. Meth. B 204 (2003) 303.
[3] E. Kr¨oll et al., Materials (Basel) 14 (20

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