# Ultimate vortex pinning by columnar defects in cuprates and iron based superconductors

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In my talk, I will take you back to 1986, the year that reshaped our understanding of superconductivity. It was then that Georg Bednorz and K. Alex Müller at IBM Zurich made their groundbreaking discovery: superconductivity in copper oxide materials at temperatures far higher than previously thought possible.

I will highlight the context of this discovery—a time when the scientific community was pushing the boundaries of materials science in search of more efficient, powerful, and sustainable technologies. High-temperature superconductors, with their ability to operate at temperatures accessible with liquid nitrogen, offered unprecedented opportunities for applications in energy, medicine, and beyond.

In the second part, I will discuss potential limitation of application of those materials due to the high flux creep phenomena. Small volume of the vortex core implies low pinning force. Combined with high anisotropy and low line tension result in low migration energy preventing motion of the vortices and emergence of resistive state. Since over 40 years the problem, how to prevent the creep and increase pinning is the key problem of HTSC. Tailoring the pining landscape by means of energetic particles revealed the favorite tool in this field. It has been demonstrated that the use of GeV range heavy ions is recognized as method to introduce amorphous traces along ion trajectory providing maximal pinning force. In other word, examination of effect of swift heavy ion irradiation on sustainable current is a method of testing ultimate values of current carried by given superconductor.

Next, I will review behavior of two families of superconductors cuprates, and iron-based superconductors (IBS) exposed to irradiation with 1.5 GeV U238. Higher values of sustainable currents observed in IBS are compatible with lower anisotropy in these materials.