

RECENT EXPOSURES OF NUCLEAR TRACK EMULSION TO RADIOACTIVE NUCLEI, NEUTRONS AND HEAVY IONS

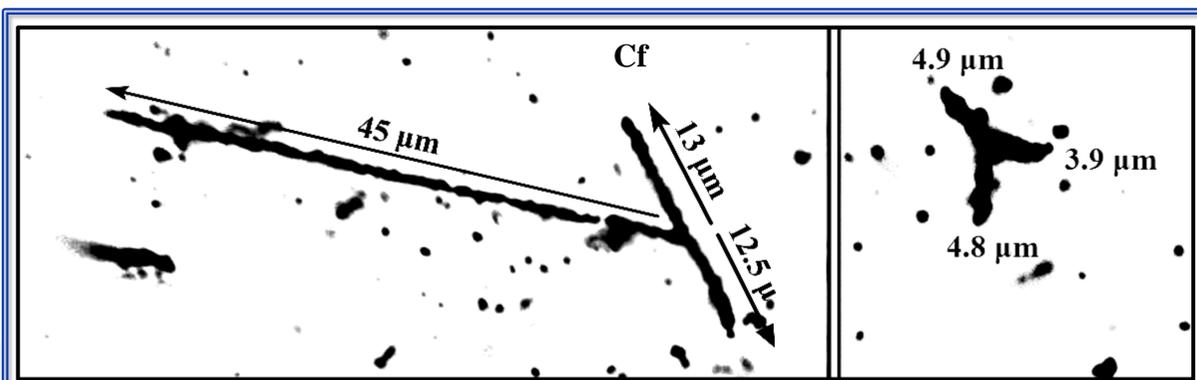
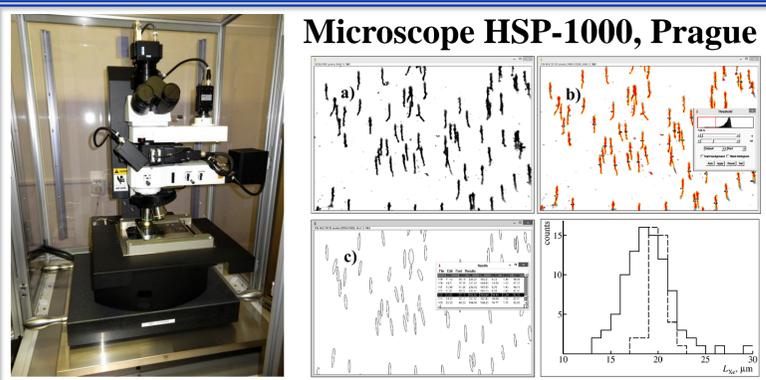
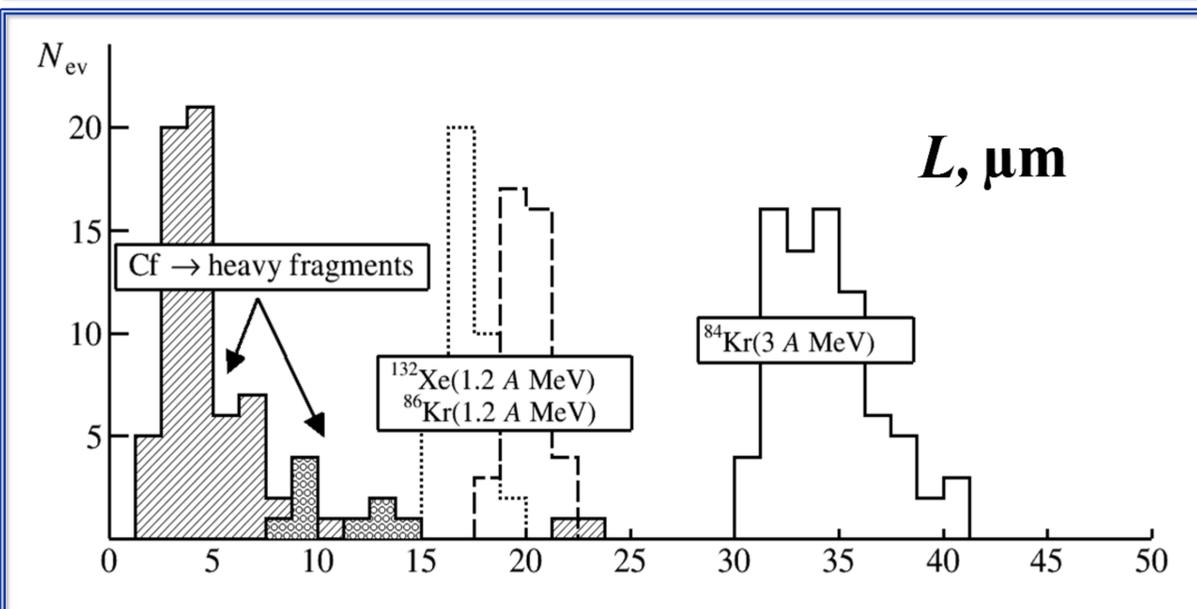
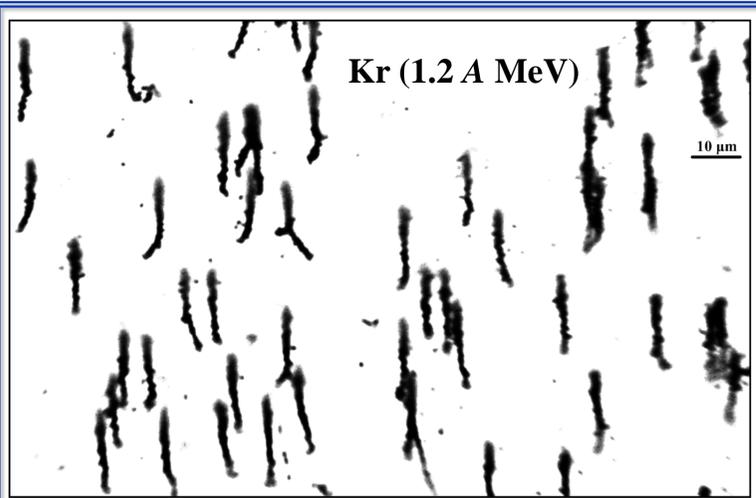
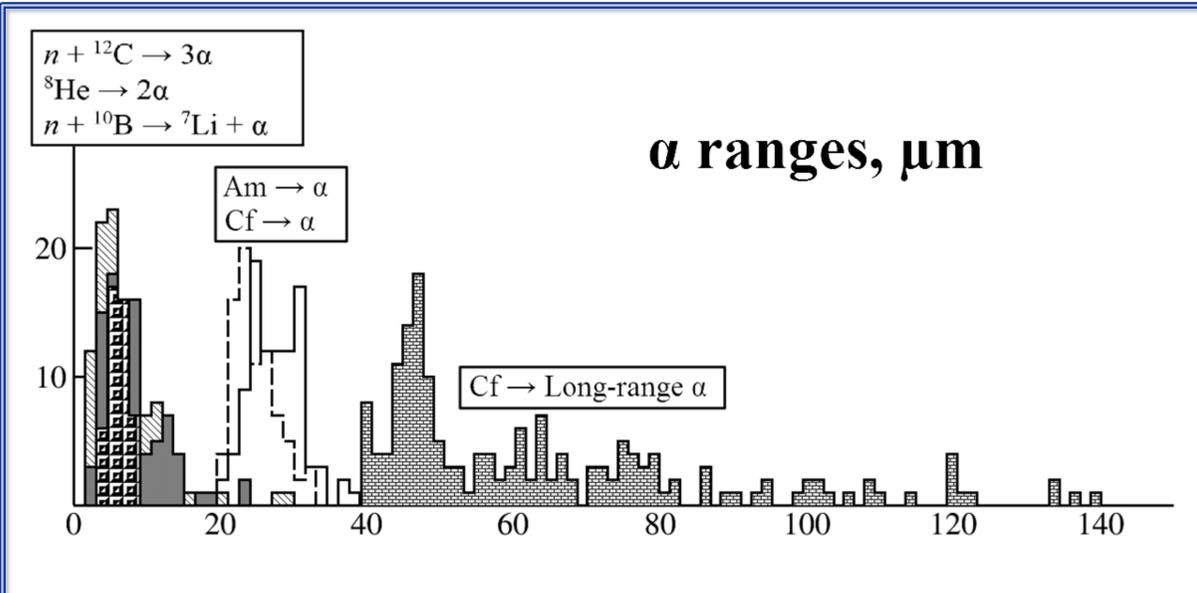
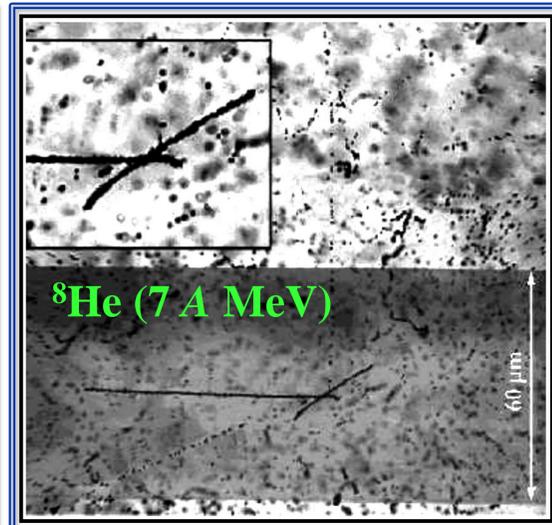
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“The BECQUEREL Project” URL <http://becquerel.jinr.ru/>

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Featuring excellent sensitivity and spatial resolution a nuclear track emulsion (NTE) maintains a position of universal and inexpensive detector for survey and exploratory research in microcosm physics¹. Use of this classical technique on beams of modern accelerators and reactors turns out highly productive. When testing the novel NTE a variety of physics tasks related with measurements of alpha-particle tracks were addressed. Decays of stopped ^8He nuclei, break-ups of ^{12}C nuclei by thermonuclear neutrons are analyzed. Splittings induced by thermal neutrons are studied in boron enriched emulsion. There arises a problem calibration of ranges of heavy ions for ternary fission studies. For this purpose Kr and Xe ions are implanted into emulsion at the JINR cyclotrons. Progress of analysis of NTE samples exposed to Am and Cf sources is presented.

Application of the nuclear track emulsion technique (NTE) in radioactivity and nuclear fission studies is discussed. It is suggested to use a HSP-1000 automated microscope for searching for a collinear cluster tripartition of heavy nuclei implanted in NTE. Calibrations of α -particles and ion ranges in a novel NTE are carried out. Surface exposures of NTE samples to a ^{252}Cf source started. Planar events containing fragments and long-range α -particles as well as fragment triples only are studied. NTE samples are calibrated by ions Kr and Xe of energy of 1.2 and 3 A MeV.



In general, the synergy of modern radioactive sources, NTE proven metrology and advanced microscopy seems to be a promising prospect for α -radioactivity and nuclear fission research. It can be assumed that ions of transfermium elements will be implanted in NTE. Their bright decays can be found as common vertices of few α -particle tracks and fission fragments. This perspective emphasizes the fundamental value of preservation and modernization of the NTE technique. Thus, the present study focused on the NTE return in practice of nuclear experiment will serve as a prototype of solution of an impressive variety of problems. Macro photos of the discussed exposures and videos based on them are available on the BECQUEREL project website.

