

⁷Be Implantation in Plastics for Prosthesis Wear Studies

Problem: Prostheses lifetimes are limited due to wear of the joint materials. Realistic wear studies of medical implants (hip/ knee) are performed in simulators using liquid lubrication. Here the traditional wear determination via mass loss is imprecise due to liquid soak.

Method:
ATOMKI (HU) produced ⁷-Be separated and accelerated to 8 MeV at HRIBF

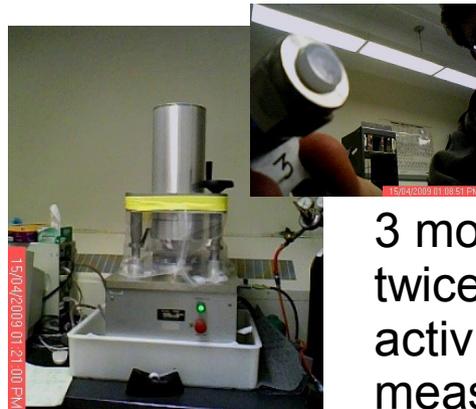


Flat ⁷-Be energy profile produced via 20 position rotating foil wheel



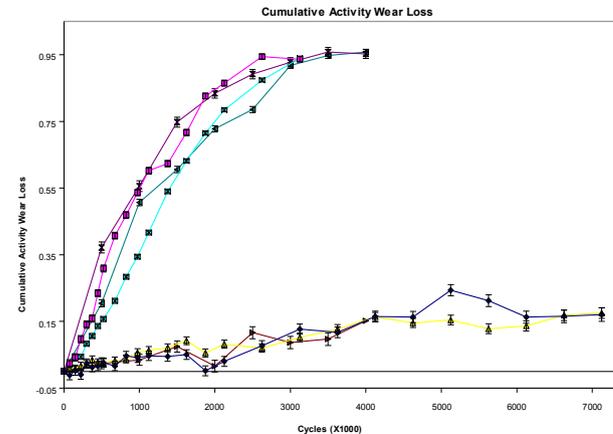
Uniform 8 micrometer deep layer implanted into crosslinked & conventional UHDE PE

Pin-on-disk wear simulator operated by RUSH at ANL; pin activity measured with Ge detector



PE pin in holder

3 months of twice weekly activity measurements



Graph shows uniform ⁷-Be distribution from surface to 80% of implantation depth

Result: First reliable measurement of liquid (bovine serum) lubricated crosslinked UHDE Polyethylene wear revealing factor 13 lower mass loss than conventional material.

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