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Modeling High Gradient Magnetic Separation in Biological Fluids D. BOCKENFELD, H. CHEN, D. REMPFER, IIT, Chicago, M. KAMINSKI, ANL, A. ROSENGART, Univ. of Chicago — A portable magnetic filter capable of separating magnetic nanospheres from arterial blood flow for detoxification of human blood is under design. In the separator design, an array of biocompatible capillary tubing and magnetizable wires is immersed into an externally applied homogeneous magnetic field. While subject to the magnetic field, the wires create high magnetic field gradients, which aid in the collection of blood- borne magnetic nanospheres from blood flow. In this study, a numerical model was created to determine the configuration of the wire-tubing array from two possible configurations. To determine which configuration was better suited for the separator design, the numerical capture efficiencies of the separator for the different configurations were compared over a range of mean blood flow velocities using subsets of the full configurations and compared with experimental results. For the configuration that showed higher capture efficiencies, the effects of blood velocity, magnetic field strength, wire and particle materials, and the length of the separator is also studied.

Dietmar Rempfer
Illinois Institute of Technology

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