

Synthesis of heparin immobilized-magnetically addressable cellulose nanofibers for biomedical applications

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This supporting information document contains 7 figures and 1 table on 8 pages.

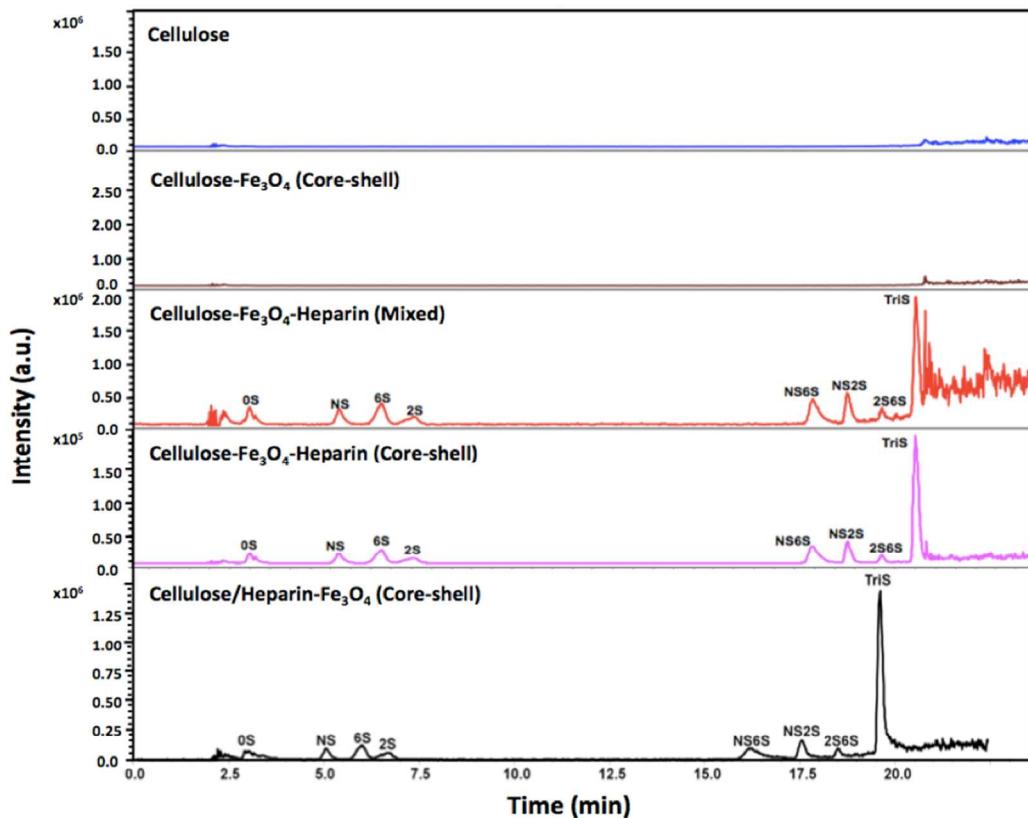
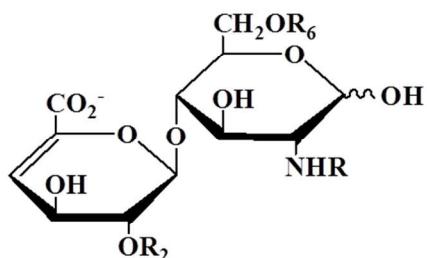


Figure S1. LC-MS analysis of heparin in composite fibers. Composite fibers digested using heparinase I,II and III enzyme overnight and the resulting disaccharide mixture was then passed through a column to achieve chromatographic separation. Finally, the eluates were subjected to mass spectrometry.

All the composite fibers (Cellulose-Magnetite-Heparin monofilament fibers, Cellulose-Magnetite-Heparin core-shell fibers and Cellulose/Heparin Magnetite core-shell fibers) showed all the disaccharide peaks correspond to the disaccharide peaks of the heparin standard shown in table 1.

Table S1. Molecular weights of disaccharide fragments of heparin standard.

Table 1



HS Disaccharides	Structure	R ₂	NR	R ₆	Molecular Weight
0S	ΔUA(1,4)GlcNAc	H	Ac	H	379.11
2S	ΔUA2S(1,4)GlcNAc	SO ₃ ⁻	Ac	H	459.07
6S	ΔUA(1,4)GalNAc6S	H	Ac	SO ₃ ⁻	459.07
NS	ΔUA(1,4)GlcNS	H	SO ₃ ⁻	H	417.06
2S6S	ΔUA2S(1,4)GlcNAc6S	SO ₃ ⁻	Ac	SO ₃ ⁻	539.03
NS2S	ΔUA2S(1,4)GlcNS	SO ₃ ⁻	SO ₃ ⁻	H	497.01
NS6S	ΔUA(1,4)GlcNS6S	H	SO ₃ ⁻	SO ₃ ⁻	497.01
TriS	ΔUA2S(1,4)GlcNS6S	SO ₃ ⁻	SO ₃ ⁻	SO ₃ ⁻	576.98

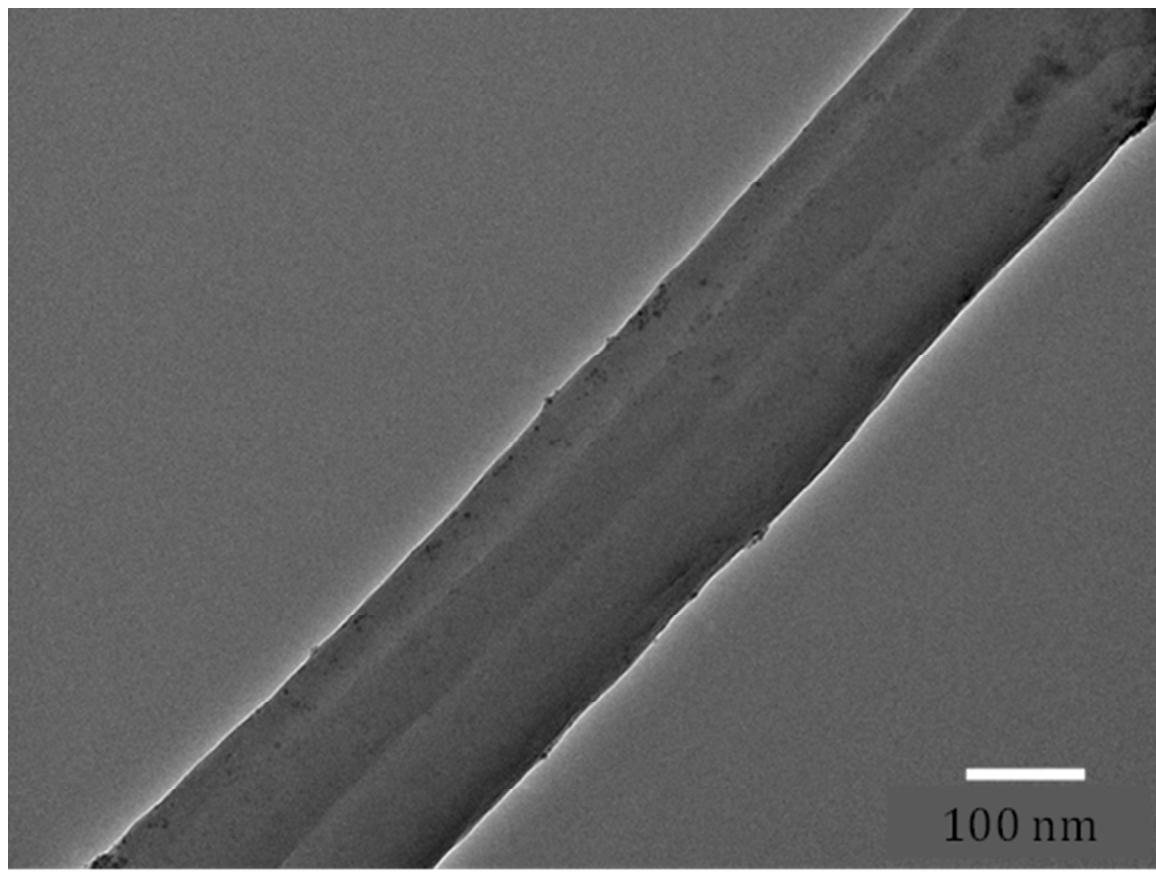


Figure S2. TEM image of Cellulose-Magnetite-Heparin core-shell fiber that shows its co-axial structure. (Fiber diameter ~415 nm with ~110 nm core diameter)

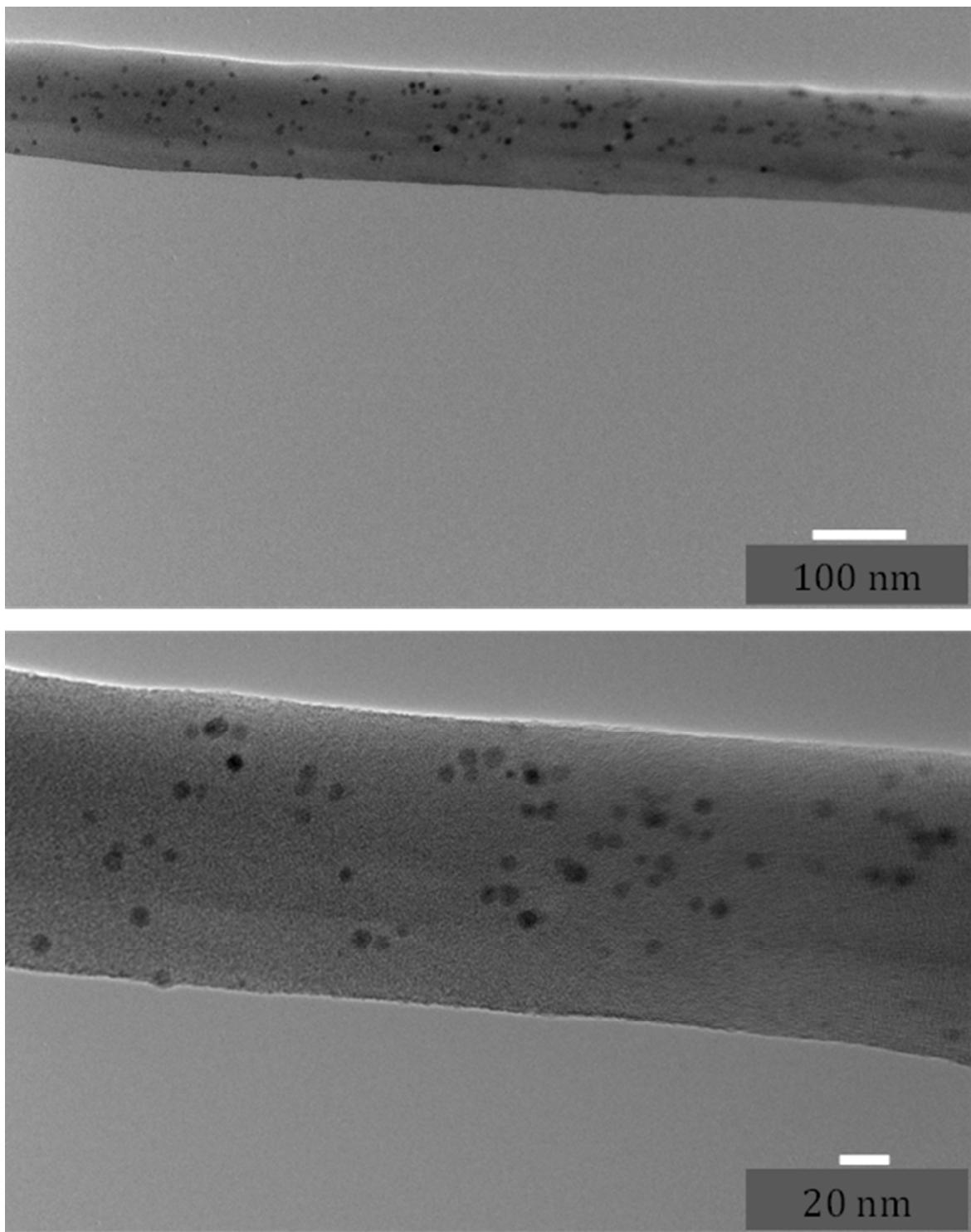


Figure S3. TEM images of Cellulose-Magnetite-Heparin monofilament fibers showing Fe₃O₄ NPs distributed throughout the interior of the fibers

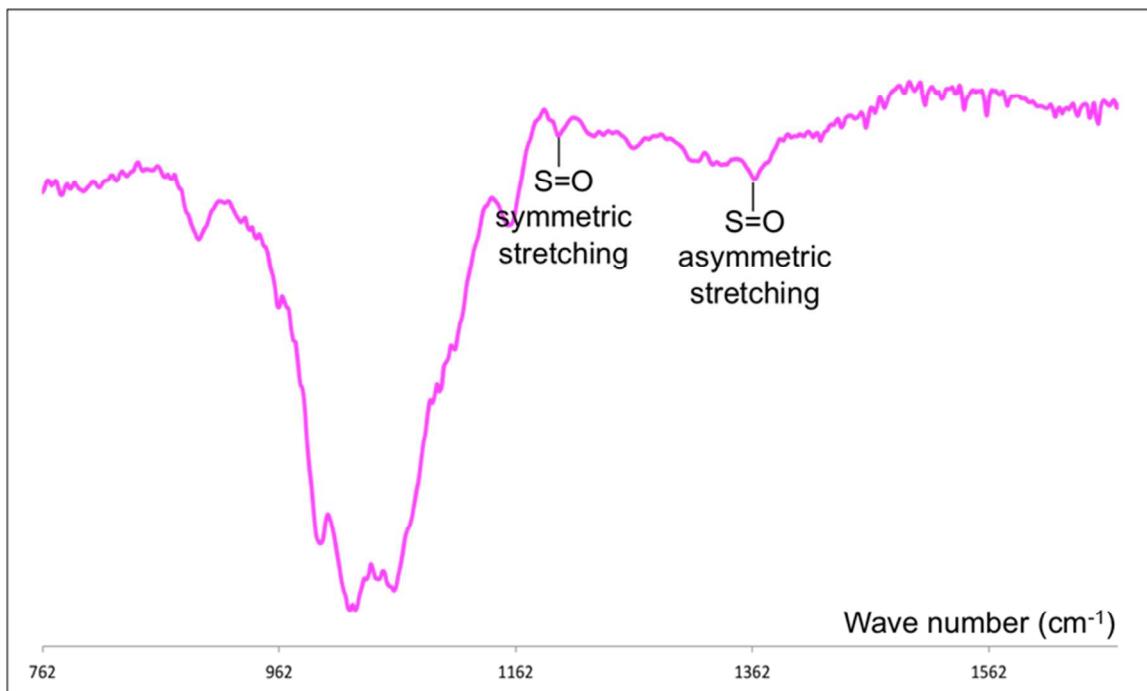


Figure S4. High resolution FTIR spectrum of Cellulose-Magnetite-Heparin core-shell fibers (Shows two small peaks at 1207 cm^{-1} and 1411 cm^{-1} that correspond to S=O symmetric and asymmetric stretching vibrations respectively)

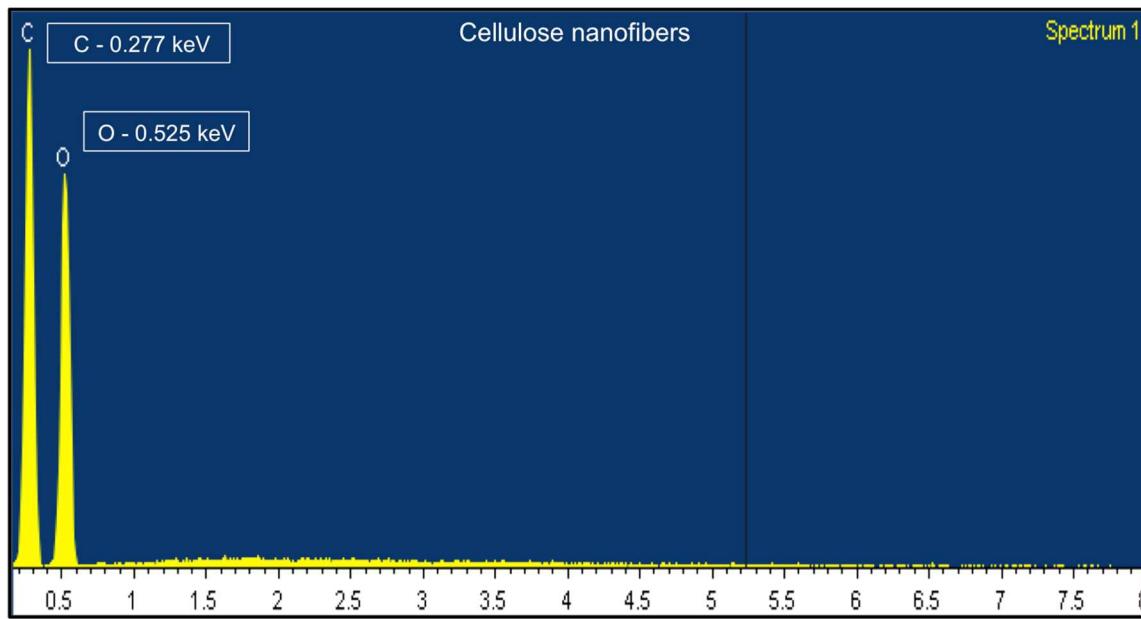


Figure S5. EDX of electrospun cellulose nanofibers.

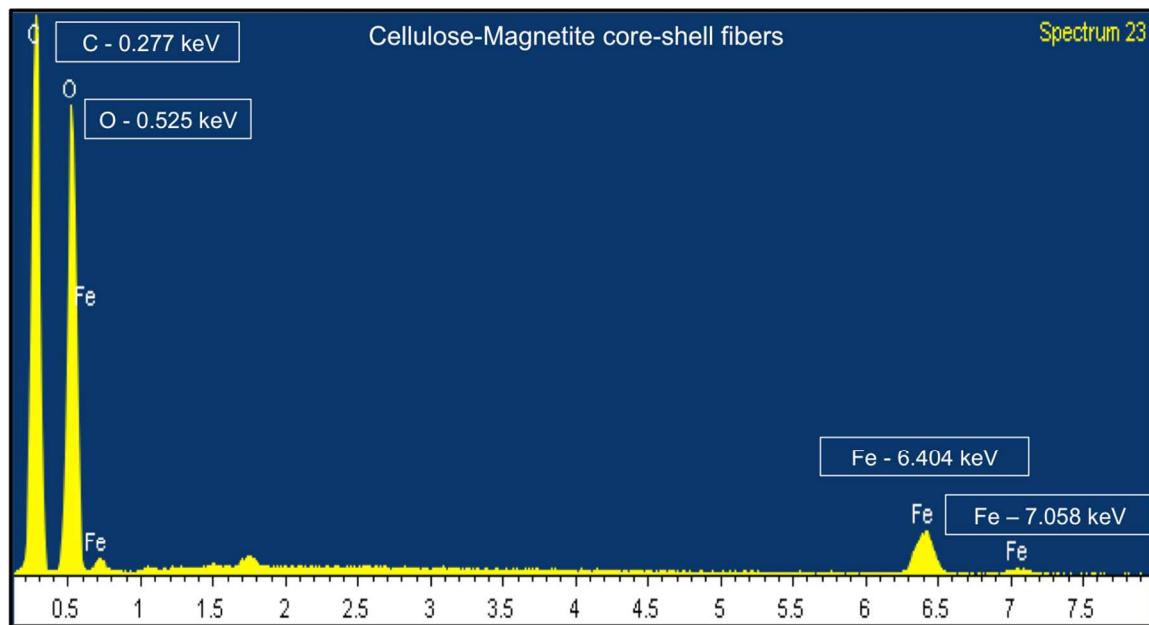


Figure S6. The EDX spectrum of Cellulose-Magnetite core-shell fibers showed a small peak around 1.74 keV. This is due to the silicon present inside the SiLi detector.

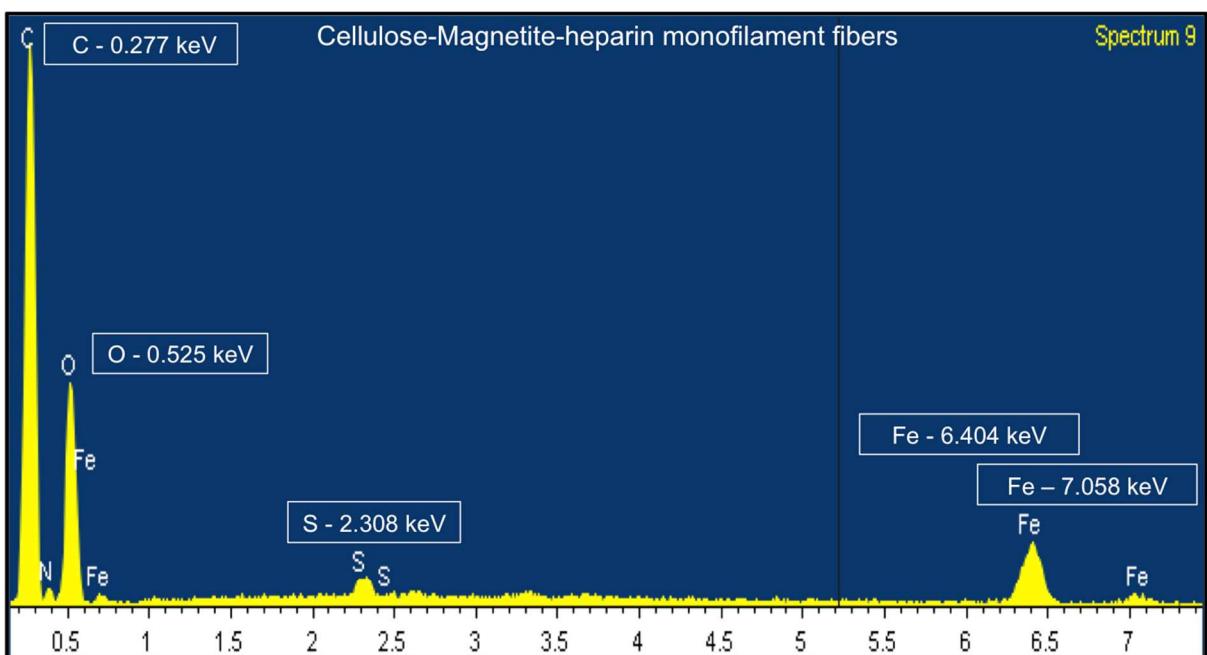
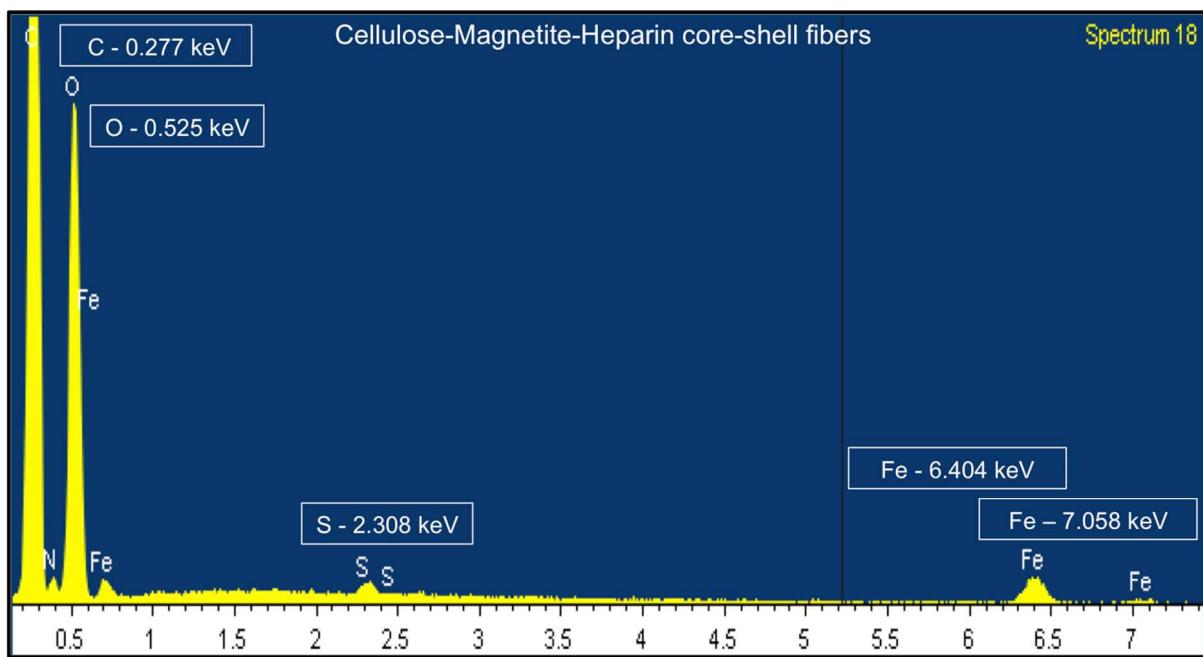


Figure S7. The EDX spectra of all of the heparin containing fibers showed characteristic peaks for sulfur confirming the presence of heparin on the fiber