

Supplementary materials for:

Ratiometric upconversion temperature sensor based on cellulose fibers modified with yttrium fluoride nanoparticles

Małgorzata Skwierczyńska ^{1,*}, Natalia Stopikowska ¹, Piotr Kulpiński ², Magdalena Kłowska ³, Stefan Lis ¹ and Marcin Runowski ^{1,4}

¹ Adam Mickiewicz University, Faculty of Chemistry, Department of Rare Earths, Uniwersytetu Poznańskiego 8, 61-614 Poznań, Poland, natalia.stopikowska@amu.edu.pl (N.S.); blis@amu.edu.pl (S.L.)

² Lodz University of Technology, Faculty of Material Technologies and Textile Design, Department of Mechanical Engineering, Informatics and Chemistry of Polymer Materials, Żeromskiego 116, 90-924 Łódź, Poland, piotr.kulpinski@p.lodz.pl (P.K.)

³ Lodz University of Technology, Faculty of Material Technologies and Textile Design, Department of Knitting Technology and Textile Machines, Żeromskiego 116, 90-924 Łódź, Poland, magdalena.klonowska@p.lodz.pl (M.K.)

⁴ Universidad de La Laguna, Departamento de Física, Apdo. Correos 456, E-38200, San Cristóbal de La Laguna, Santa Cruz de Tenerife, Spain, mrunowsk@ull.edu.es (M.R.)

* Correspondence: malgorzata.skwierczynska@amu.edu.pl; (M.S.)

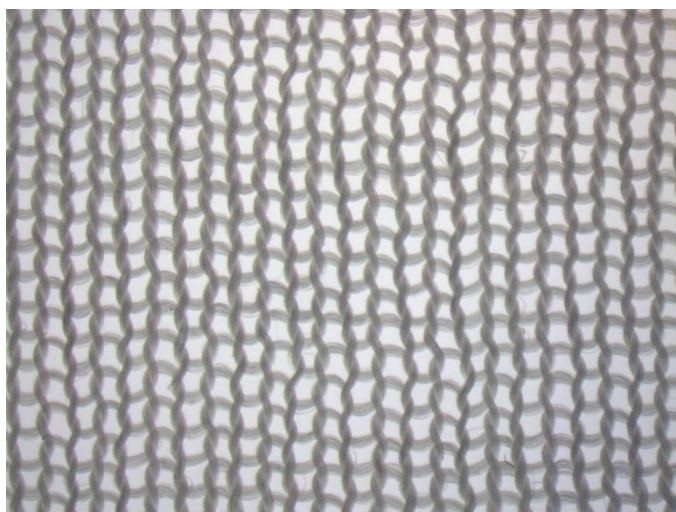


Figure S1 Right side of the knitted fabric

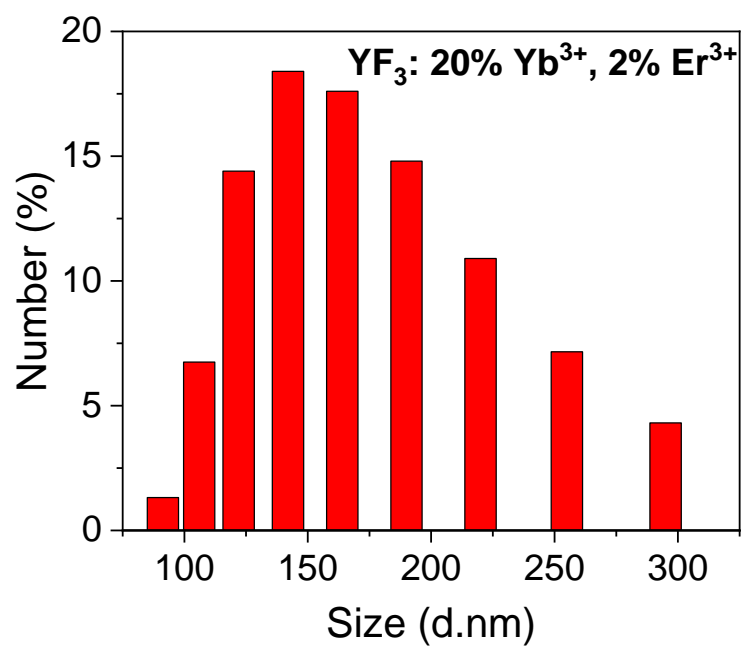


Figure S2 DLS analysis of YF₃: 20 % Yb³⁺, 2 % Er³⁺ NPs.

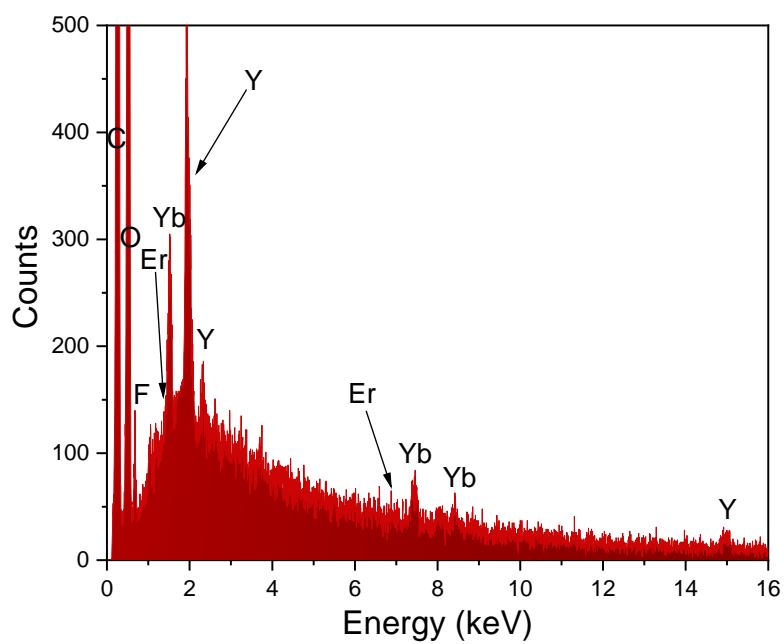


Figure S3 EDX spectra of YF₃-modified cellulose fibers.

Table S1 Basic structural and physical parameters of a knitted fabric made of YF₃-modified cellulose fibers.

	Number of wales [wale/cm]	Number of courses [course/cm]	Fabric thickness [mm]	Mas per unit area [g/m ²]
Mean value	10.0	14.0	0.67	125.0
Standard deviation	0.52	0.48	0.01	2.57

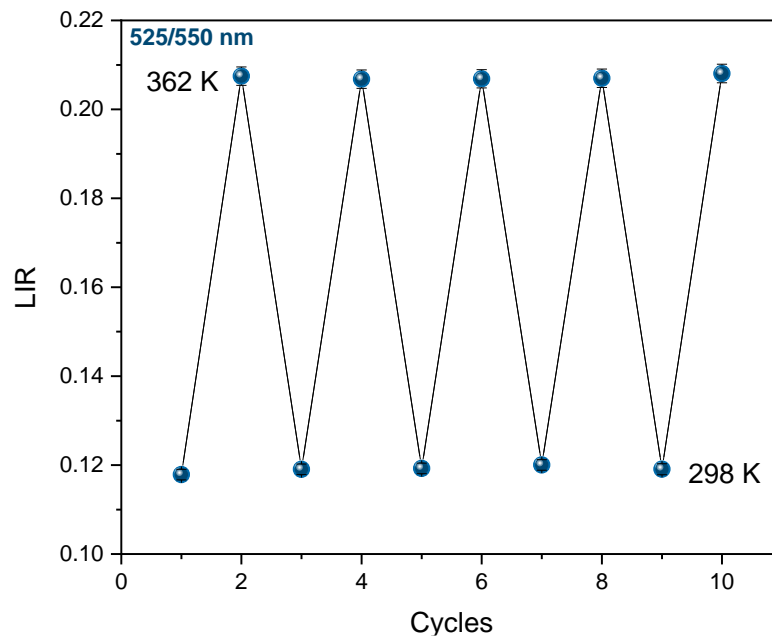


Figure S4 Thermal cycling of YF₃-modified fibers between 298 K and 362 K, for the determined thermometric parameters, i.e. Er³⁺: 525/550 nm band ratio, λ_{ex} = 975 nm.