Supporting Information

Pyrolysis study of solution-derived superconducting $YBa_2Cu_3O_7$ films: disentangling the physico-chemical transformations

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Videos

Video S1: Optical microscopy of a film prepared with solution 1 heated from room temperature to 320 ℃ at different heating rates within three temperature intervals.

Video S2: Optical microscopy of a film prepared with solution 1 heated from 200 ℃ to 240 ℃ at 2 ℃/min showing reversible wrinkling formation.

Video S3: Optical microscopy of a film prepared with solution 1 heated from 150 ℃ to 240 ℃ at 15 ℃/min showing irreversible wrinkling formation.

Video S4: Optical microscopy of a film prepared with solution 1+DEA heated from 150 ℃ to 270 ℃ at 5 ℃/min showing reversible wrinkling formation.

Video S5: Optical microscopy of a film prepared with solution 2 heated from 150 ℃ to 270 ℃ at 10 ℃/min showing reversible wrinkling formation.

ADDITIONAL FIGURES

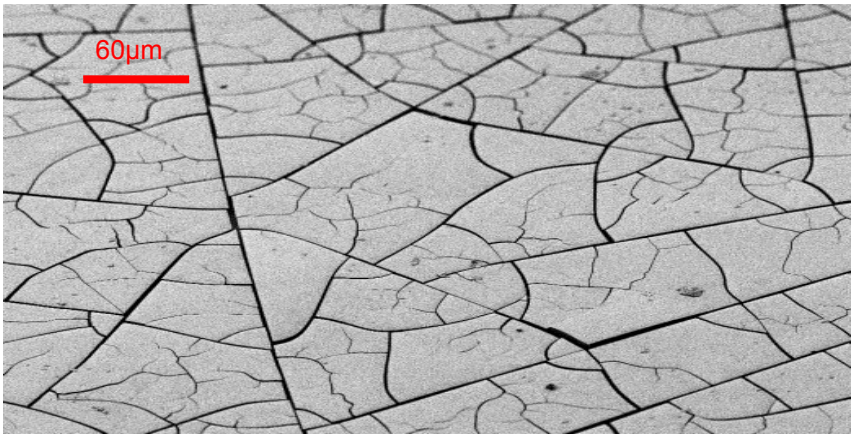
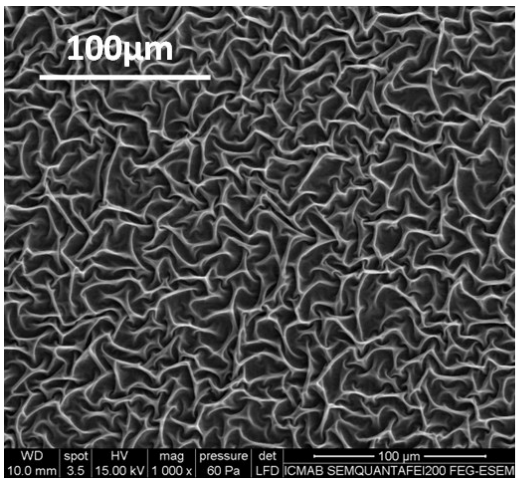


Figure S1. Typical crack network visualized by SEM in a YBCO film after growth. Typical pyrolysis conditions: 160°C-240°C at 10ºC/min; 240-320°C at 5°C/min.



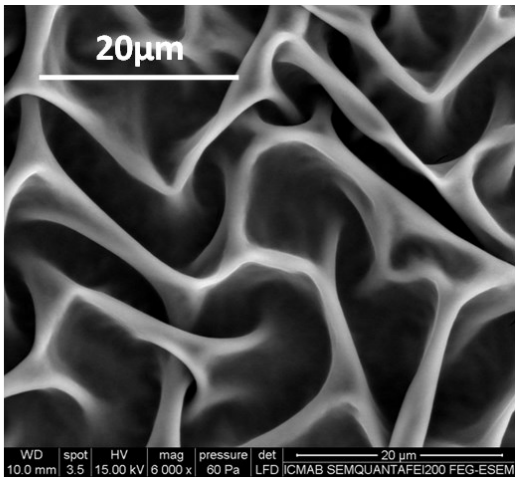


Figure S2. SEM images of a film surface buckled after pyrolysis magnified x1000 (left) and x 6000 (right). Films deposited using a solution 1 with a nominal thickness of 700 nm after growth.

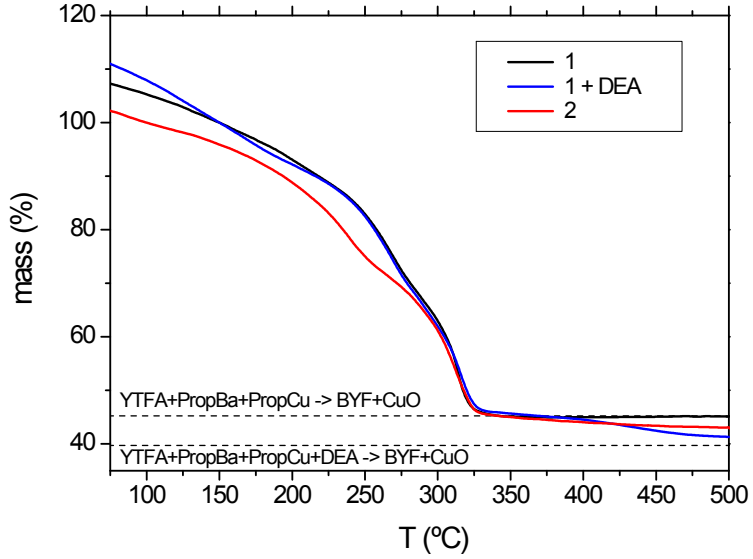


Figure S3. TGA analysis of YBCO films prepared from three different metalorganic solutions. The expected mass loss for the final pyrolized films is also indicated. Analysis performed in humid Oxygen atmosphere with a heating ramp of 20°C/min.

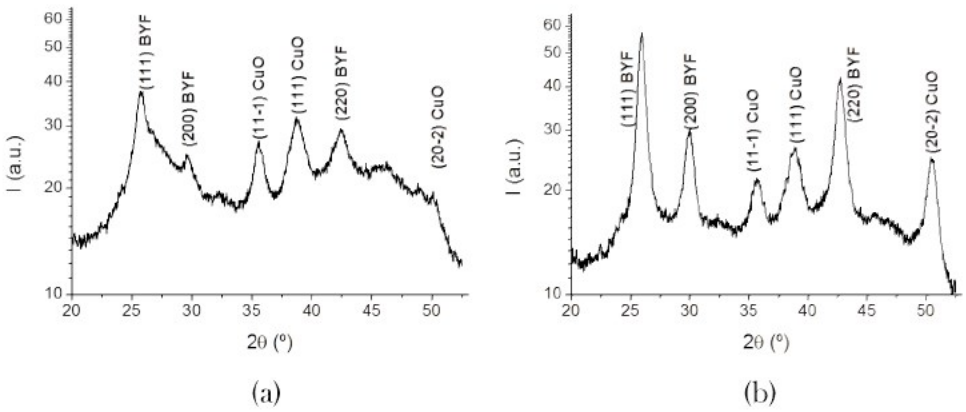


Figure S4. (2D) X-ray integrated diffraction pattern for a YBCO film pyrolyzed at (a) 320°C and (b) 500°C. The Bragg peaks corresponding to different phases (CuO, BYF) are identified.

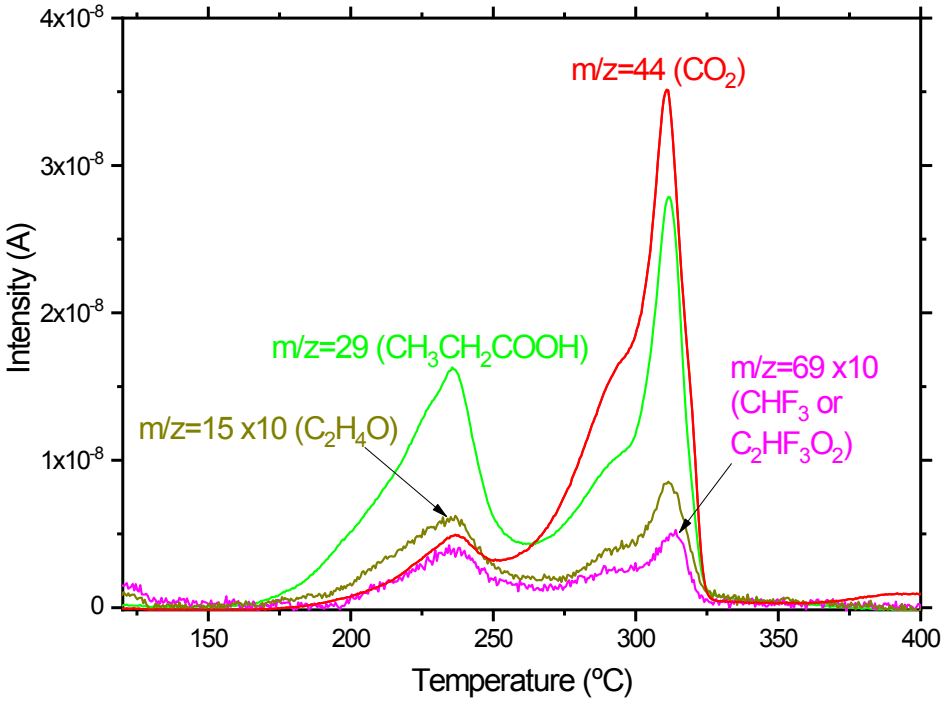


Figure S5. EGA-MS analysis or a solution 1 heated at 5°C/min in humid O2 atmosphere (total pressure 10^{-5} mbar). Evolution of the main fragments, the related volatile is indicated in parenthesis.

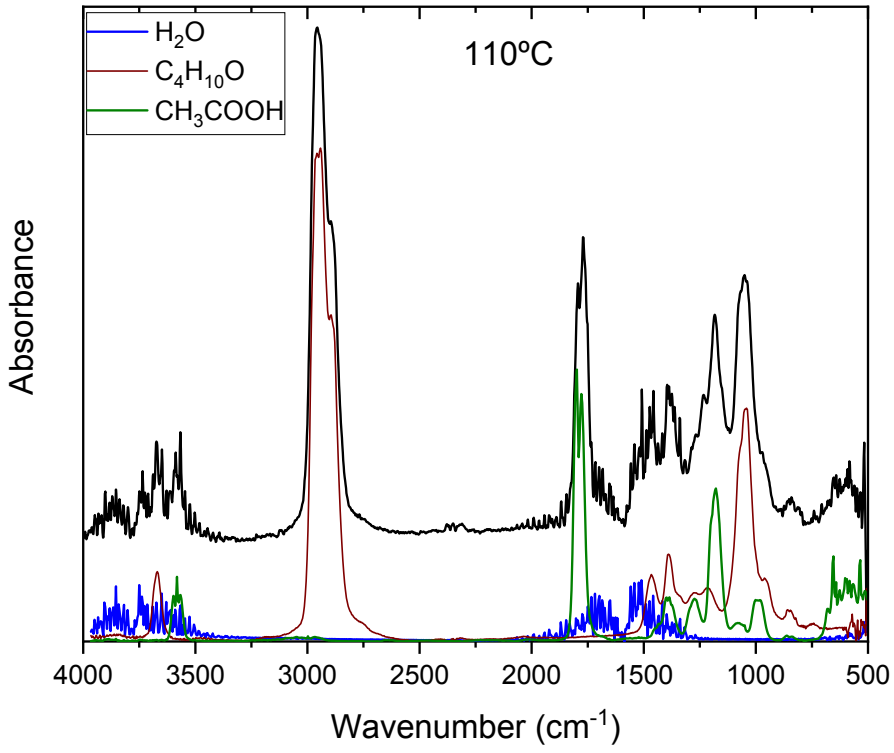


Figure S6. Top shifted curve (black line): FT-IR spectra of the volatiles evolved at 110°C for a solution 2. Bottom curves are all reference spectra obtained from the NIST library [1].

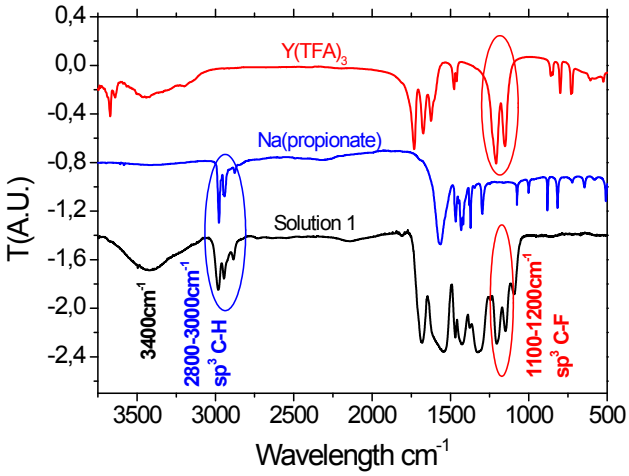


Figure S7. IR spectra for a sample after drying at 145°C for 45 minutes (black). In blue and red, the spectra of sodium propionate and yttrium trifluoroacetate respectively is shown. The absorbance band of the alkane group (C-H str.) used for the propionate determination is encircled in blue. Inside the red circle we find the bands corresponding to fluoromethyl (C-F str.) absorbance, assigned to trifluoroacetate molecule.

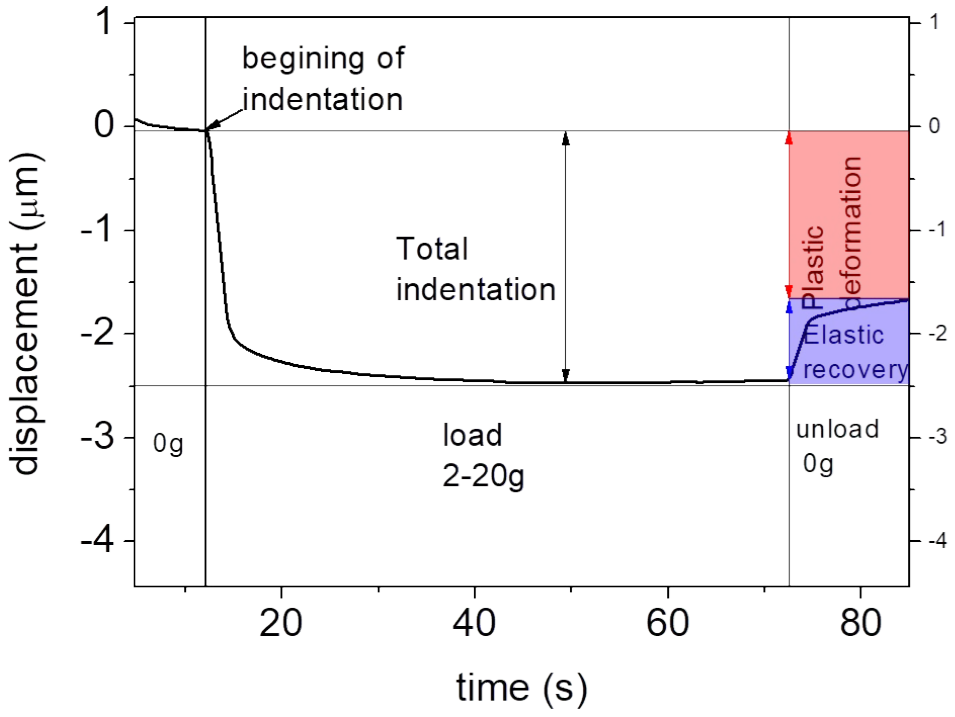


Figure S8. Typical example of a displacement curve obtained in a thermomechanical analysis (TMA) for a solid where elastic recovery is identified.

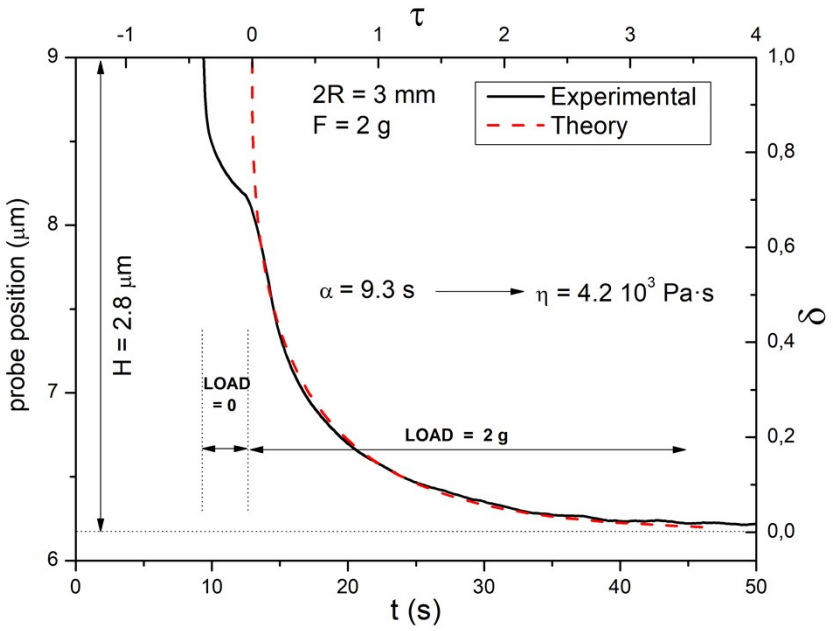


Figure S9. Typical fitting obtained from a TMA curve made according to eq. 3 of the main text. The experimental curve corresponds to a TMA performed at 260°C for a YBCO film made from 1+DEA solution.

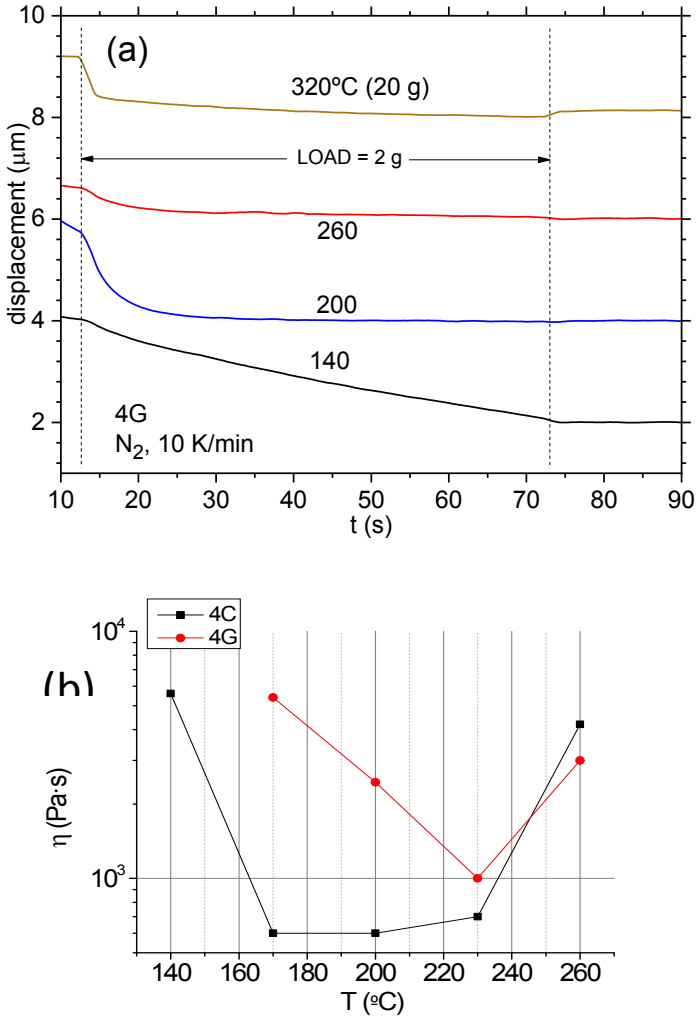


Figure S10. (a) Displacement curves over time obtained from the TMA of a solution 2 with 0.5M. The applied load was 2g except for the measure at 320°C; (b) Plot with the viscosity values obtained from the TMA measurements of solution 1 + DEA (black) and solution 2 with 0.5M (red).

References

[1] Wallace W. Infrared spectra. In: Linstrom PJ, Mallard WG, editors. NIST Chem WebBook, NIST Stand Ref Database. Gaithersburg MD: Institute of Standards and Technology; 2019. p. 20899