Supplementary Data #1 : Evaluation of the released amount of [Lidocainium][Ibuprofenate]

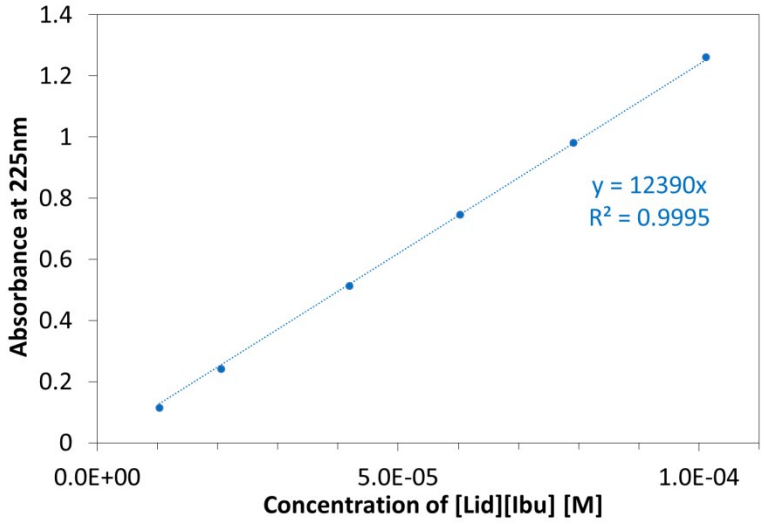


Figure SD-1. *Calibration curve of UV spectroscopy at λ=225nm with PBS solutions of [Lid][Ibu]*

The released amount of [Lidocainium][Ibuprofenate] at each dipping time *t* in 300 mL PBS at 37°C from the powder (Z20[Lid][Ibu]$_{Pow}$), or the extruded sample (Z20[Lid][Ibu]$_{Fil}$), is calculated as following from aliquot *i* of 2 mL used for UV analysis:

$$\frac{M_t}{M_0} = \left[300 \times \left(\left(\frac{Absorbance_{\lambda_{225nmi}}}{12390}\right) \times M_{[Lid][Ibu]}\right) \div M_0\right]_i + \int_0^i \left[\left(2 \times \left(\frac{Absorbance_{\lambda_{225nm}}}{12390}\right) \times M_{[Lid][}\right.\right.$$

(Eq. SD-1)

with M_t [mg], the amount of [Lid][Ibu] released at instant *t*; M_0, the initial amount of [Lid][Ibu] [mg]; coefficient *12390* M^{-1}, from the UV calibration curve (Fig. SD-1) and $M_{[Lid][ibu]}$ = 440.63 g.mol^{-1}, the molar mass of [Lid][Ibu].[12]

Supplementary Data #2 : Determination of the specific mechanical energy during the extrusion of zein-based filament plasticized by 20w%[Lidocainium][Ibuprofenate] ($Ø_{die}$ = 2 mm)

The powder mixture, Z20[Lid][Ibu]$_{Pow}$, is processed with a twin-screw microcompounder (Haake Minilab, Thermo Scientific GmbH ; Karlsruhe, DE) set at a constant screw rotation rate N = 50 rpm and 130°C.

The average torque is measured during the extrusion of the filament, Z20[Lid][Ibu]$_{Fil}$, at T = 0.23 N.m, for a powder mixture feed rate Q = 1.8 g.min^{-1}.

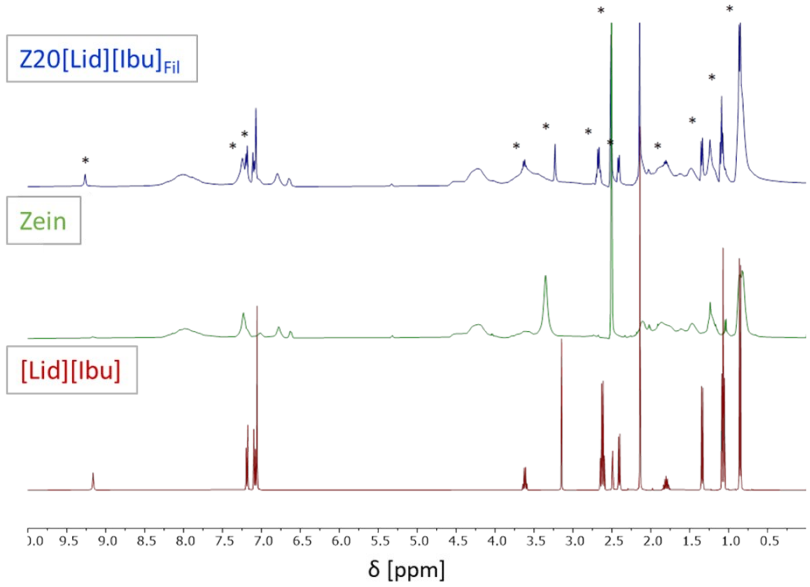
The specific mechanical energy, SME [J.g^{-1}], is calculated as following:

$$SME = 2.\pi.C.N/Q \qquad \text{(Eq. SD-2)}$$

SME is evaluated at about 40 J.g^{-1}.

Supplementary Data #3 : NMR spectra recorded at room temperature in DMSO-d6 of extruded filament Z20[Lid][Ibu]$_{Fil}$, raw zein and pure [Lid][Ibu]

a-



b-

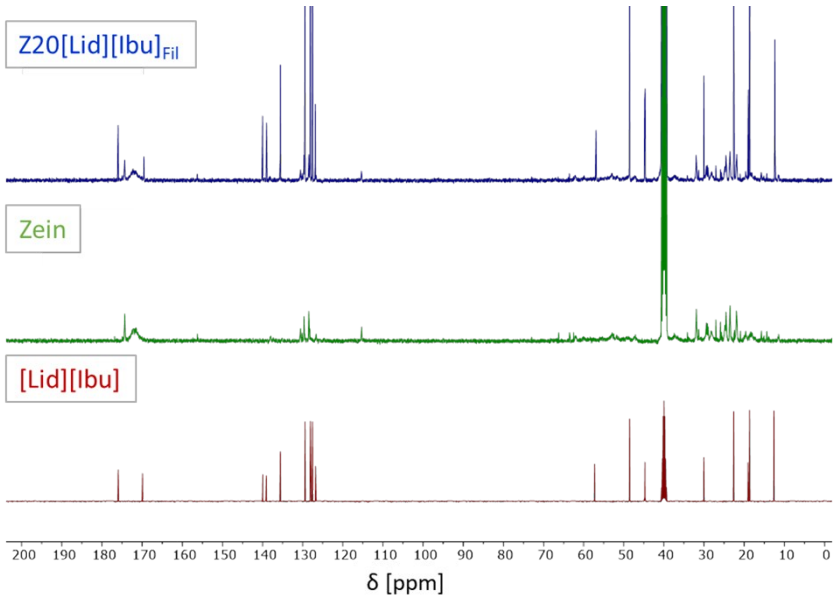
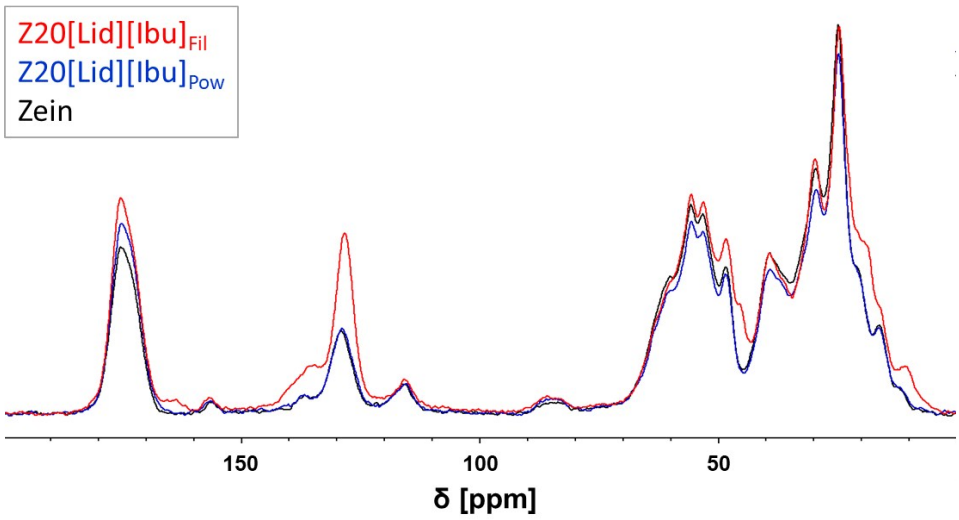


Figure SD-3. *Comparison of NMR spectra recorded at room temperature in DMSO-d6 of extruded filament Z20[Lid][Ibu]$_{Fil}$, raw zein and pure [Lid][Ibu]: ^{1}H NMR (* corresponds to [Lid][Ibu] signals ; a-) and ^{13}C NMR (b-).*

Supplementary Data #4 : Solid state NMR spectra of extruded filament (Z20[Lid][Ibu]$_{Fil}$), powder blend (Z20[Lid][Ibu]$_{Pow}$) and raw zein

a-



b-

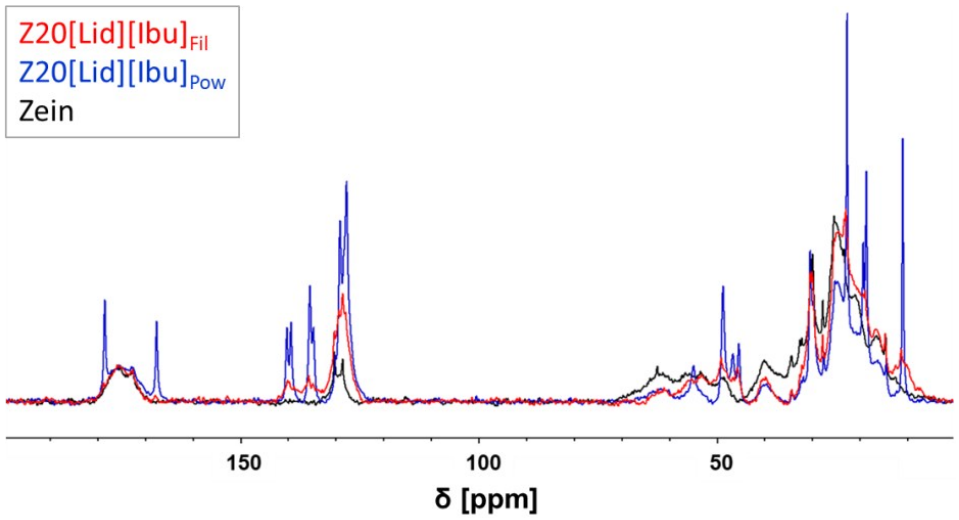


Figure SD-4. Solid state NMR spectra of extruded filament (Z20[Lid][Ibu]$_{Fil}$), powder blend (Z20[Lid][Ibu]$_{Pow}$) and raw zein. CP-MAS spectra revealed the rigid part (a-) DP-MAS spectra revealed the mobile part (b-). All spectra areas are standardized compared to the real mass of each sample.