Supporting Information

Rationally Designed Cellulose Hydrogel for Ultrasensitive Pressure Sensor

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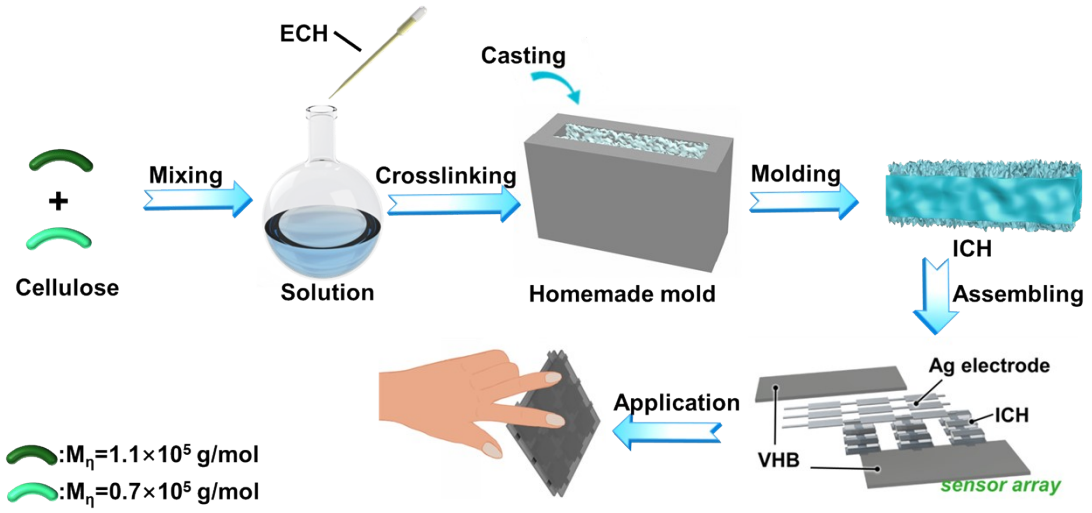

Figure S1. Preparation of ICHs.

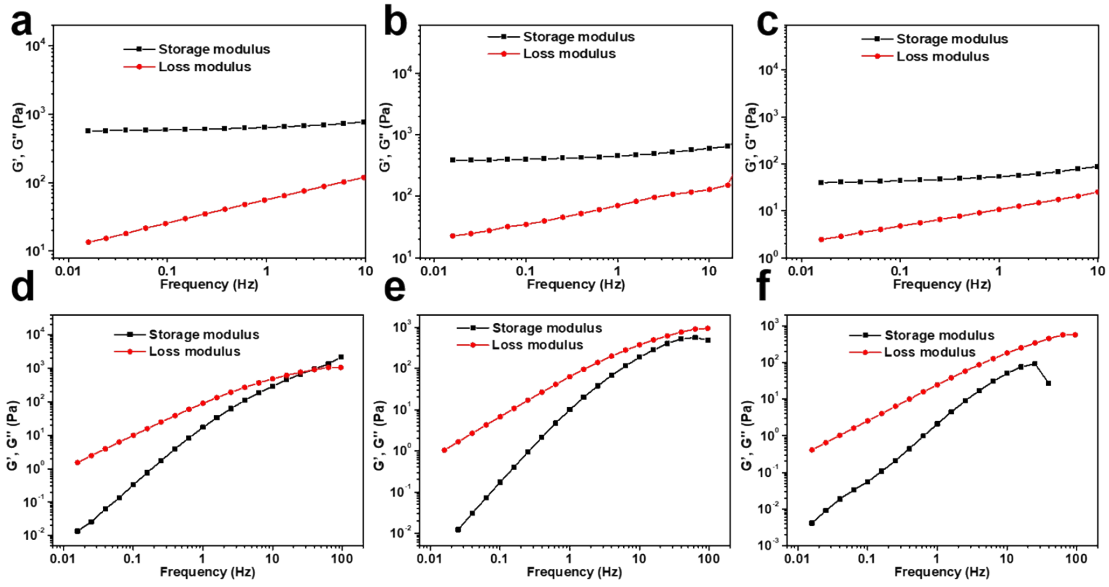

Figure S2. Storage modulus (*G*') and loss modulus (*G*'') of the (a) C6/0R0 ICH, (b) C4/2R0 ICH, (c) C2/4R0 ICH, (d) C6/0R0 solution, (e) C4/2R0 solution, (f) C2/4R0 solution.

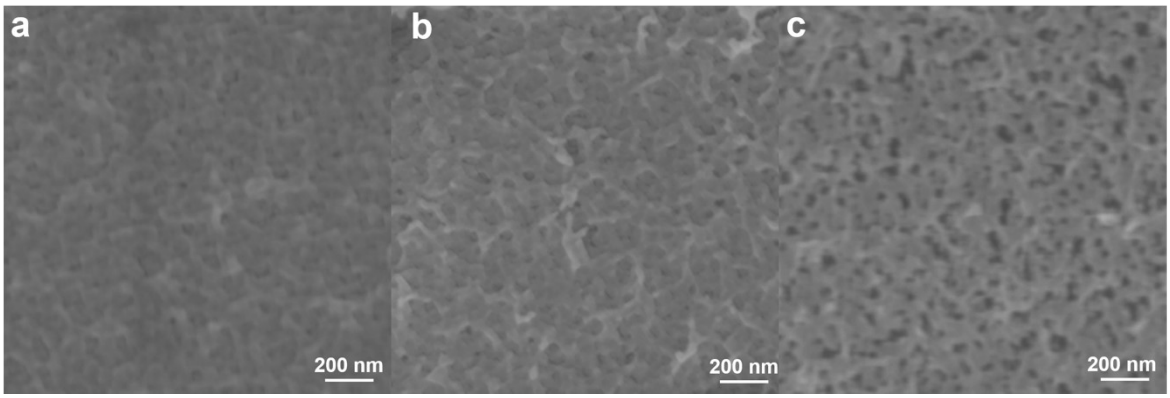

Figure S3. SEM images of (a) C6/0R0, (b) C4/2R0, and (c) C2/4R0.

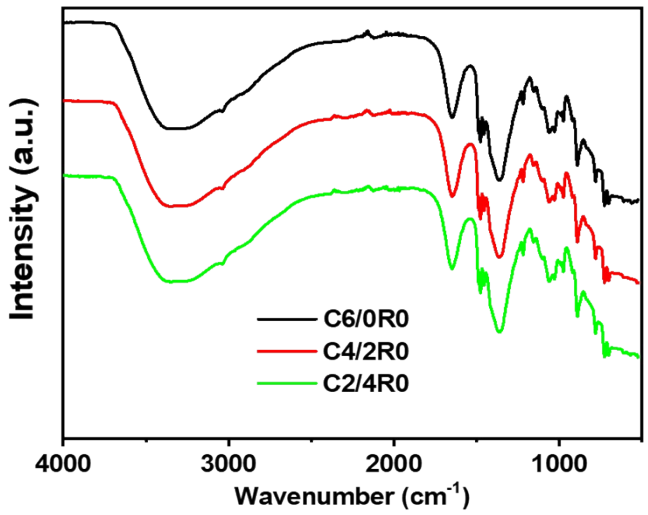

Figure S4. FT-IR spectra of the ICHs.

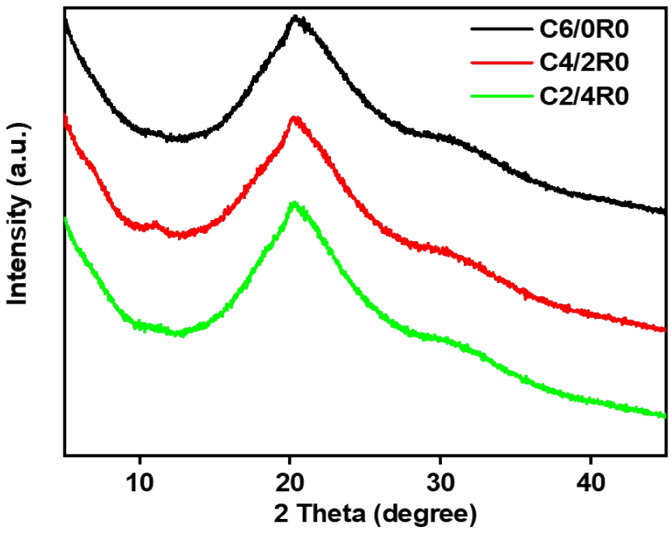

Figure S5. XRD patterns of the ICHs.

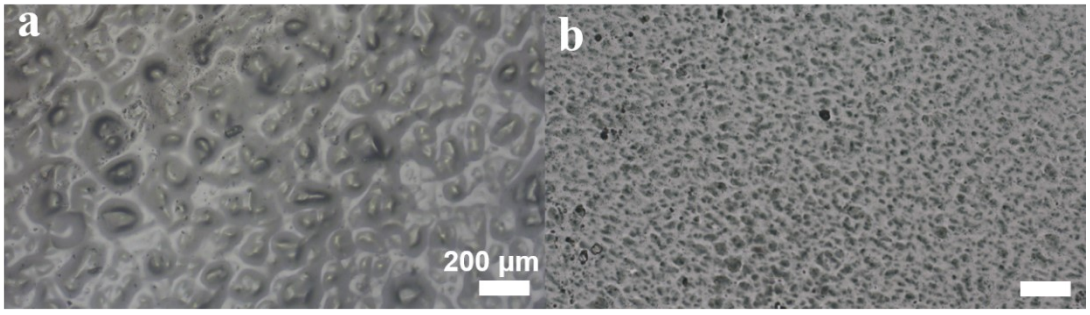

Figure S6. Optical microscope images of (a) C6/0R500, and (b) C6/0R1000.

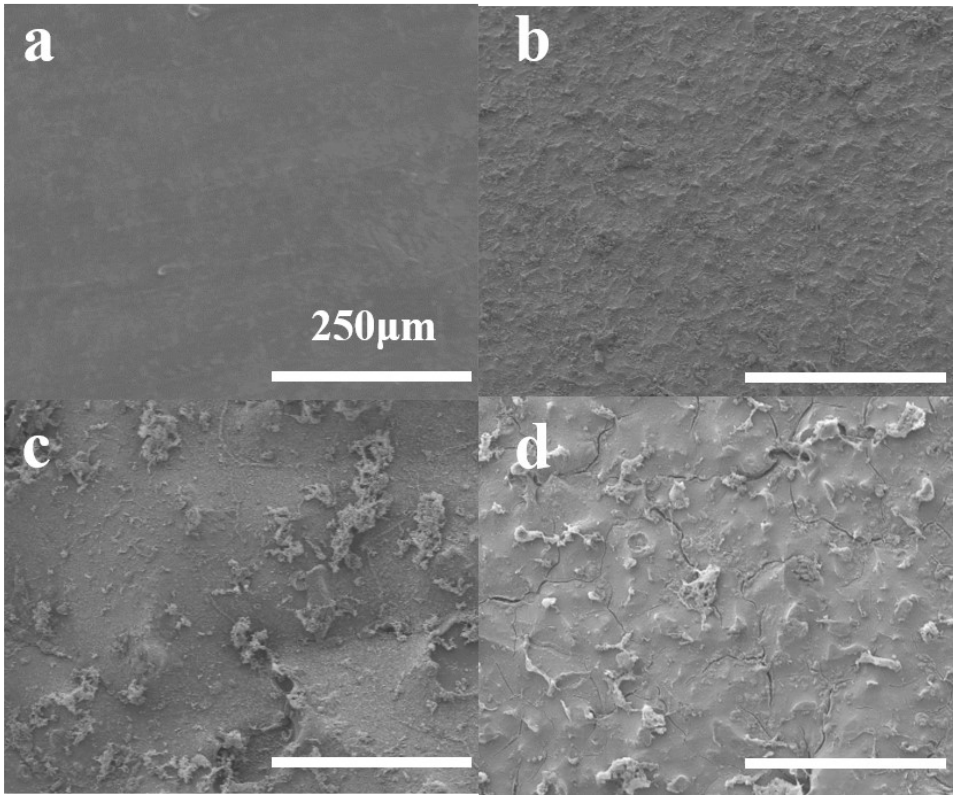

Figure S7. Surface SEM images of (a) C6/0R0, (b) C6/0R1000, (c) C6/0R500, and (d) C6/0R100.

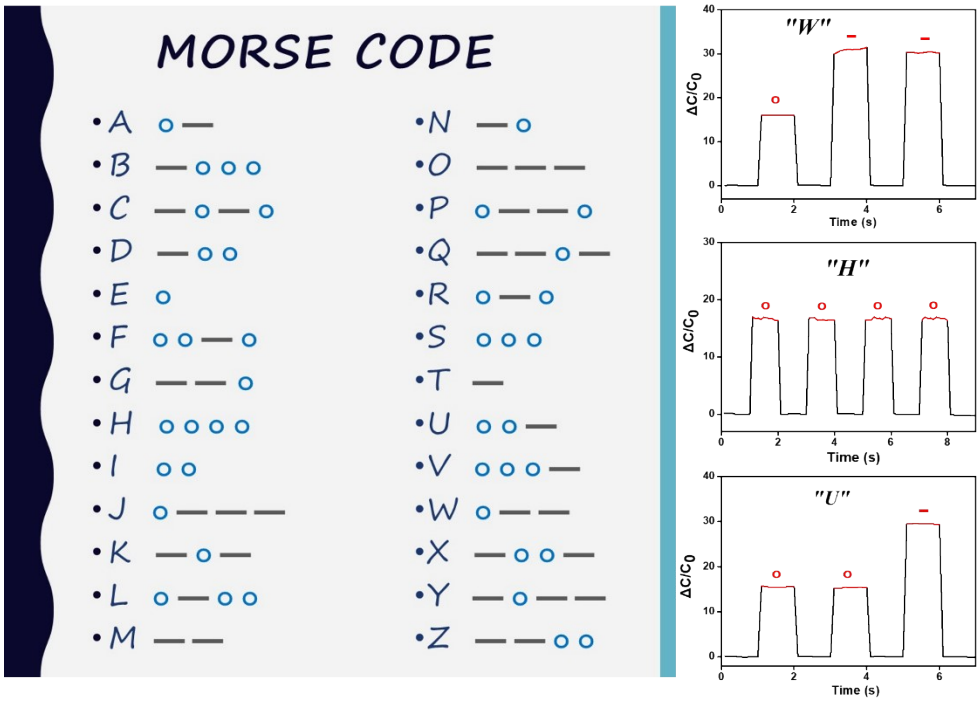

Figure S8. Use Morse code to type "W", "H", "U" by tapping on the ICH pressure sensor.

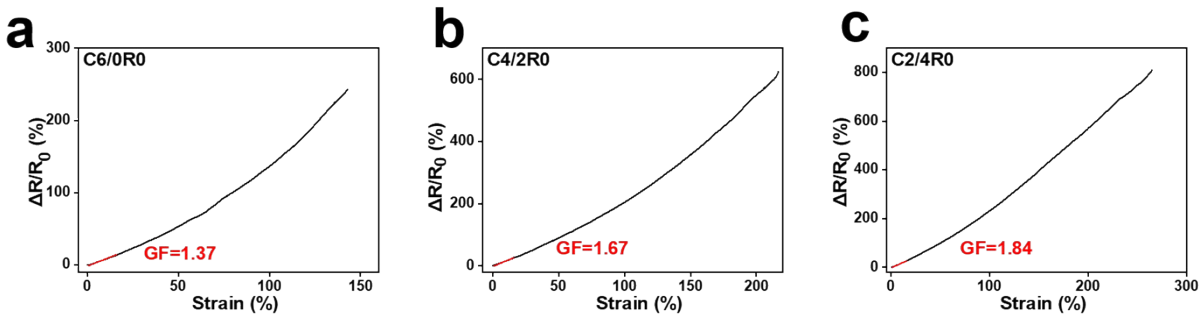

Figure S9. The $\Delta R/R_0$ and GF of (a) C6/0R0 ICH, (b) C4/2R0 ICH, and (c) C2/4R0 ICH.

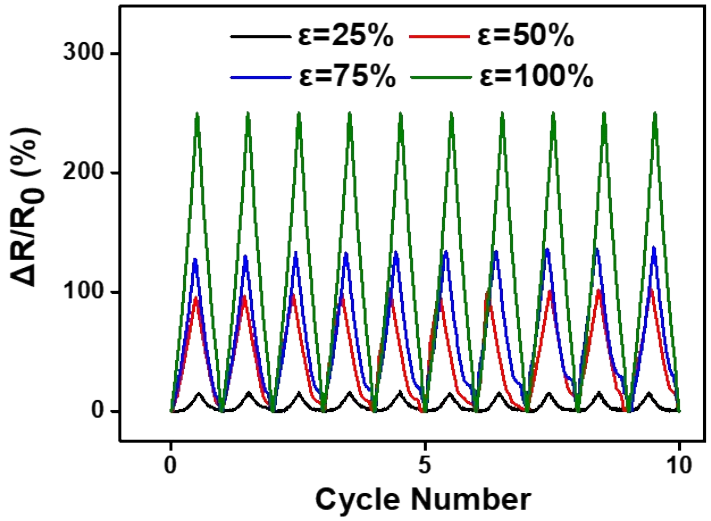

Figure S10. Resistance response of repeated stretching tests of the C2/4R0 at different strains (25%, 50%, 75% and 100%).

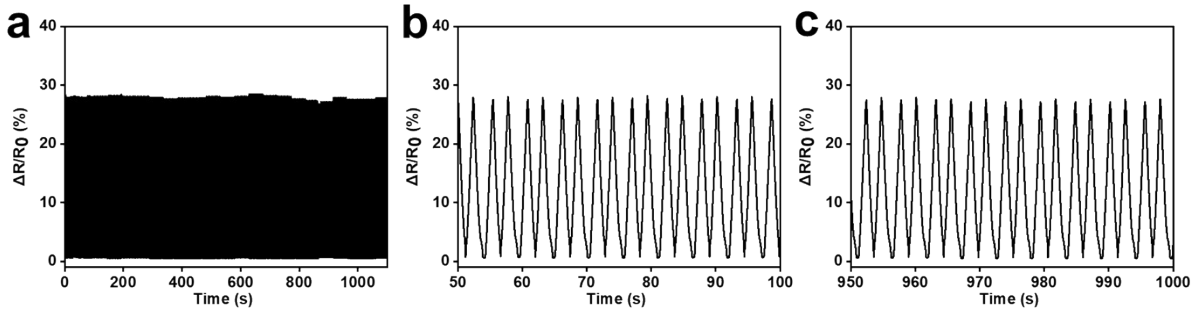

Figure S11. (a) Resistance response of the C2/4R0 with applied tensile strain between 0 and 20% for 500 cycles; before (b) and after (c) the cycle.

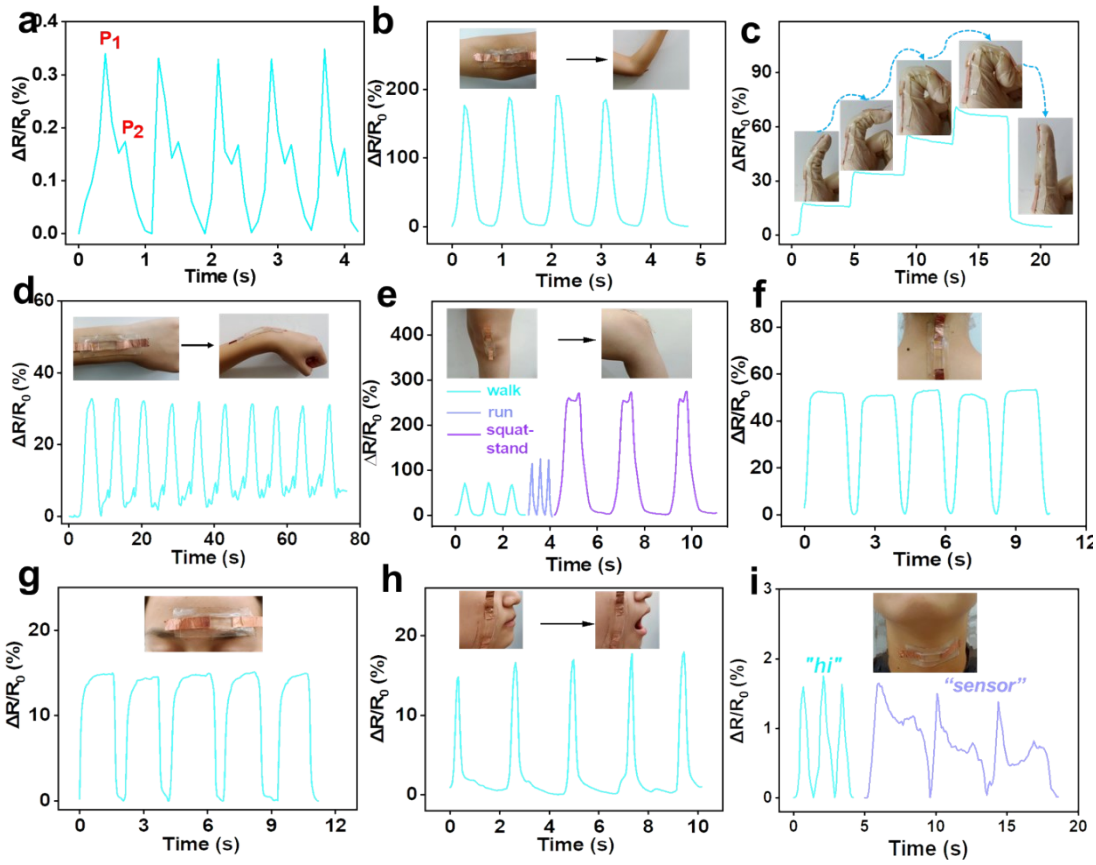

Figure S12. (a) The recorded relative resistance change of blood pulse. Response of ICH sensor in monitoring bending of (b) arm, (c) finger, (d) wrist and (e) knee, (f) bowing, (g) frowning, (h) opening mouth. (i) Monitored real-time $\Delta R/R_0$ signals from speaking “hi” and “sensor”.

Table S1. Mesh parameters obtained from ICHs and cellulose solutions.

Samples	^1N (m^{-3})	d_{mesh} (nm)
C6/0R0 solution	3.15◊10^{23}	14.7
C4/2R0 solution	1.20◊10^{23}	20.3
C2/4R0 solution	0.15◊10^{23}	40.5
C6/0R0 ICH	2.07◊10^{23}	16.9
C4/2R0 ICH	1.51◊10^{23}	18.8

C2/4R0 ICH	$0.07◊10^{23}$	52.9

Table S2. Conductivity of the reported ionic conductive hydrogels.

Material	Ionic Conductor	Conductivity ($S \cdot m^{-1}$)	Reference
PAM/PEO	LiCl	8	[1]
PVA/PAM	NaCl	6.23	[2]
C2/4R0	*$BzMe_3NOH$*	*3.17*	*This work*
PAAm/LiCl	LiCl	3.8-8.1	[3]
PVA/HPC	NaCl	3.4	[4]
PAAM/Laponite	Citrate Sodium	2.22	[5]
PAM/SS/NaCl	NaCl	1.68	[6]
PEGDA/glycerin	$CaCl_2$/KCl	0.765	[7]
PCBAA	$MgCl_2$	0.7	[8]
PAA/Fe_3O_4/IL	IL	0.1	[9]
PVA/PSBMA	PSBMA	0.05	[10]
P(SPMA-r-MMA)	SPMA	6.7×10^{-6}	[11]
PVA	Emim-Cl	1.6	[12]
PAAm/Gelatin DN	Na_3Cit	1.5	[13]
chitosan/PEGDA	citrate anionic solution	0.5	[14]
allyl cellulose	NaOH	0.16	[15]
agar/polyacrylamide	NaCl	0.04	[16]
Cellulose	EG/NaCl	1.92	[17]

Table S3. Sensitivity (*S*) of the reported flexible pressure sensors.

Materials	*S* (kPa^{-1})	Transparent	Reference
PAA/silver nanoparticles hydrogel	171	No	[18]
PU-IL composite foam	9280	No	[19]
Alginate hydrogel	9.32	Yes	[20]
Cellulose/PVA	13.91	Yes	[21]
Cellulose	*89.81*	*Yes*	*This work*
CNF/BNC complex	0.003	No	[22]
ACC/PAA/alginate	0.17	No	[23]
PVA/PU	0.141	Yes	[24]
PNDU-CNF@CNT	1.11	Yes	[25]
κ-CG/P(AAm-co-AAc) hydrogels	0.33	No	[26]
CHN	0.6	Yes	[27]
gelatin/DATNFC/Fe^{3+} hydrogel	1.14	No	[28]
polyacrylamide-alginate hydrogel	0.91	Yes	[29]
PVA- H_3PO_4 hydrogel	2296	No	[30]
PGMH	14.117	No	[31]
PVA hydrogel	1.09	No	[32]

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