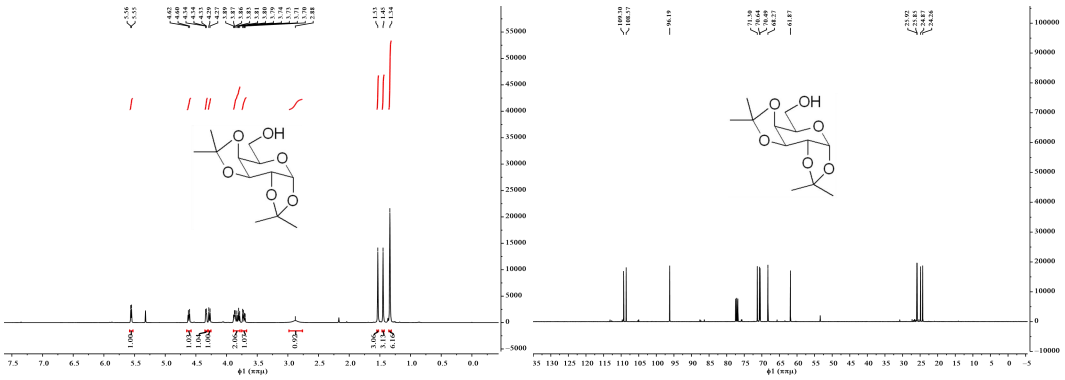


Figure S1. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound 1.

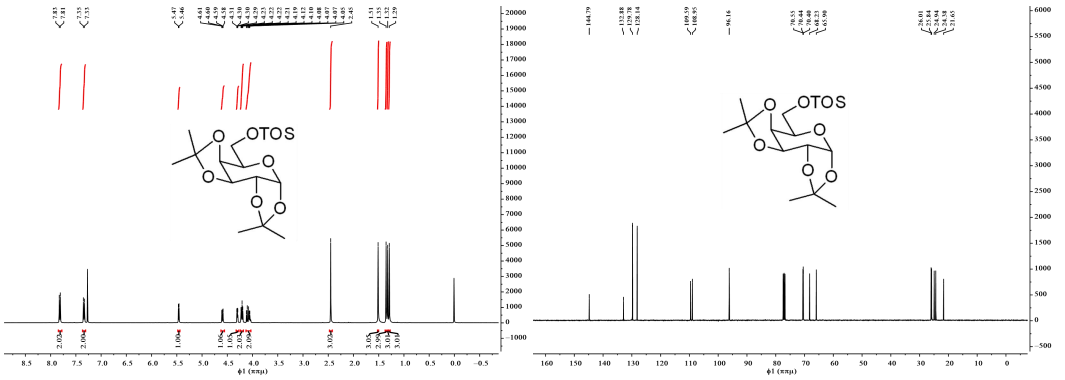


Figure S2. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound 2.

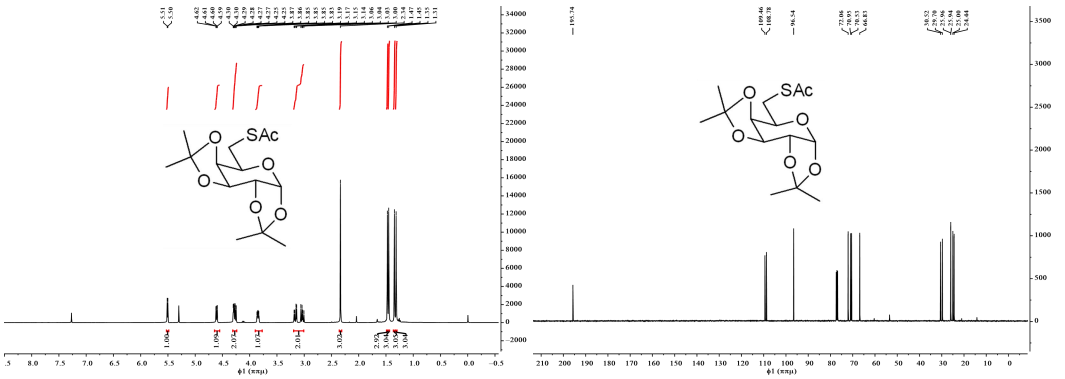


Figure S3. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound 3.

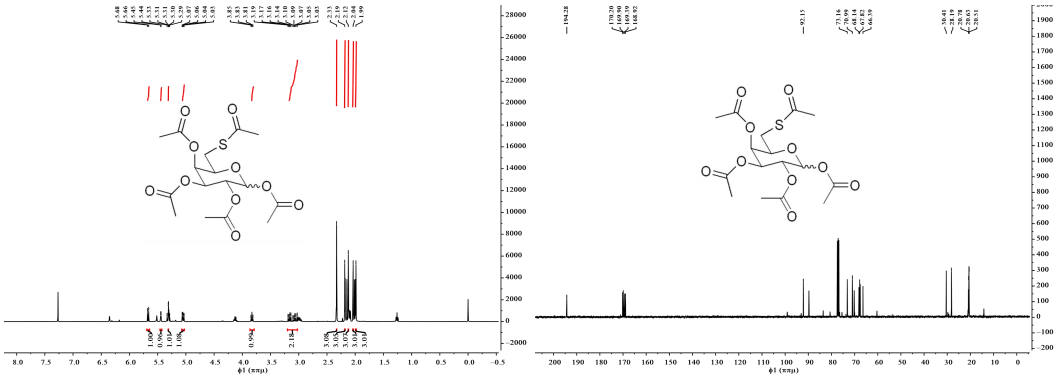


Figure S4. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound 5.

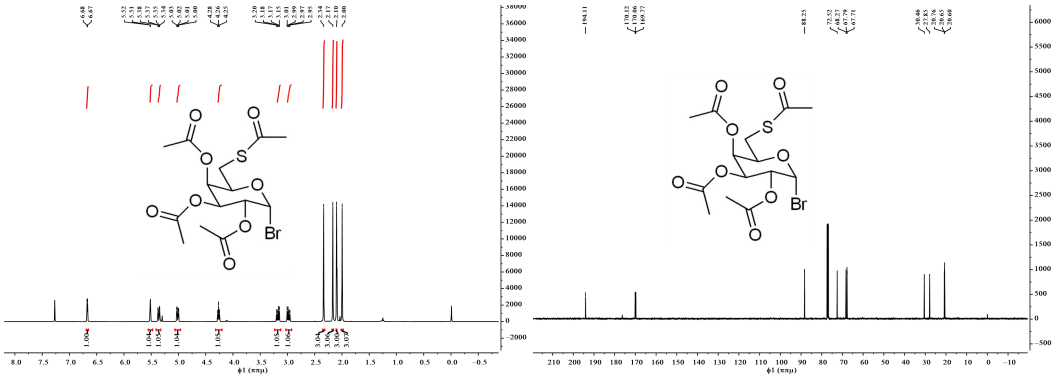


Figure S5. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound 6.

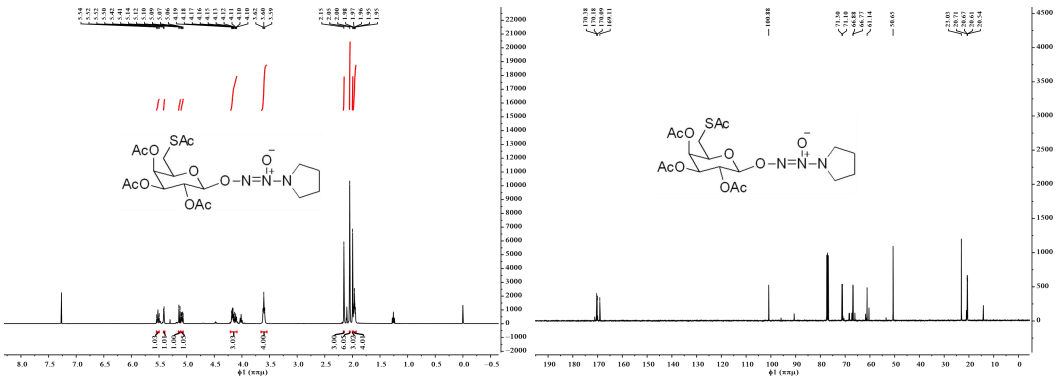


Figure S6. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound 7.

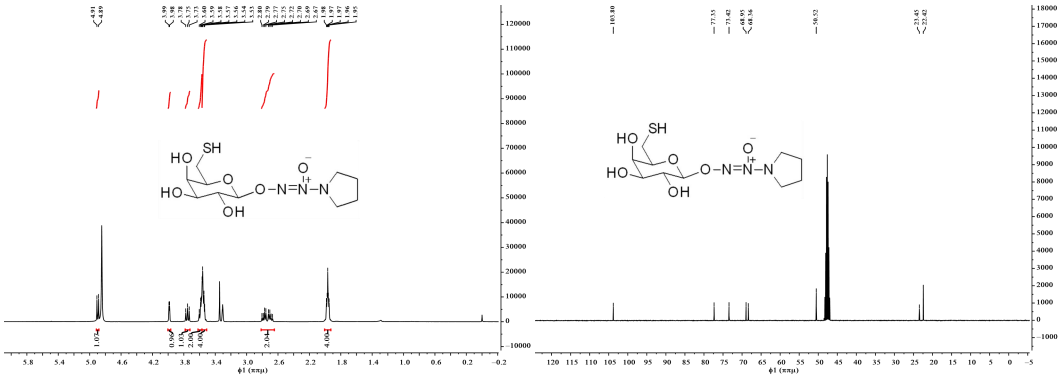


Figure S7. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound SNO.

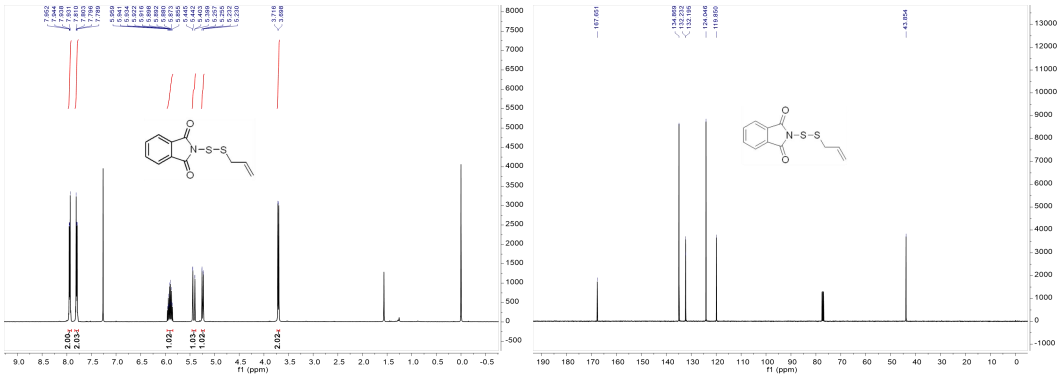
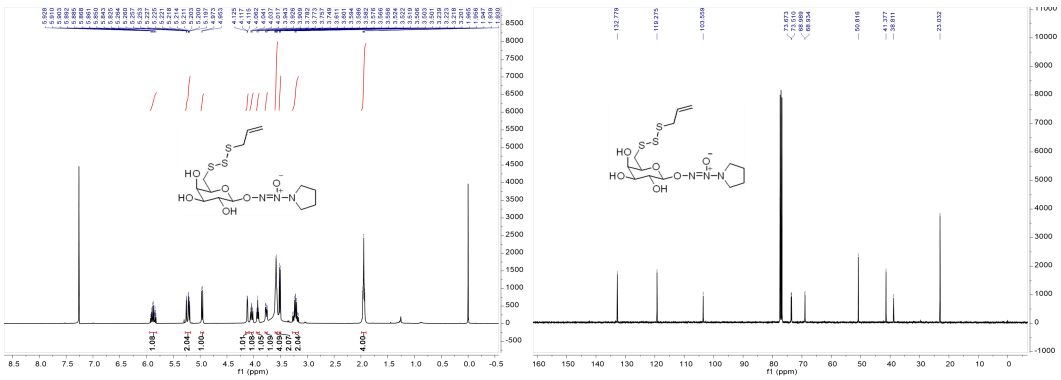


Figure S8. ^{1}H NMR (left) and ^{13}C NMR (right) spectrum of compound 8.



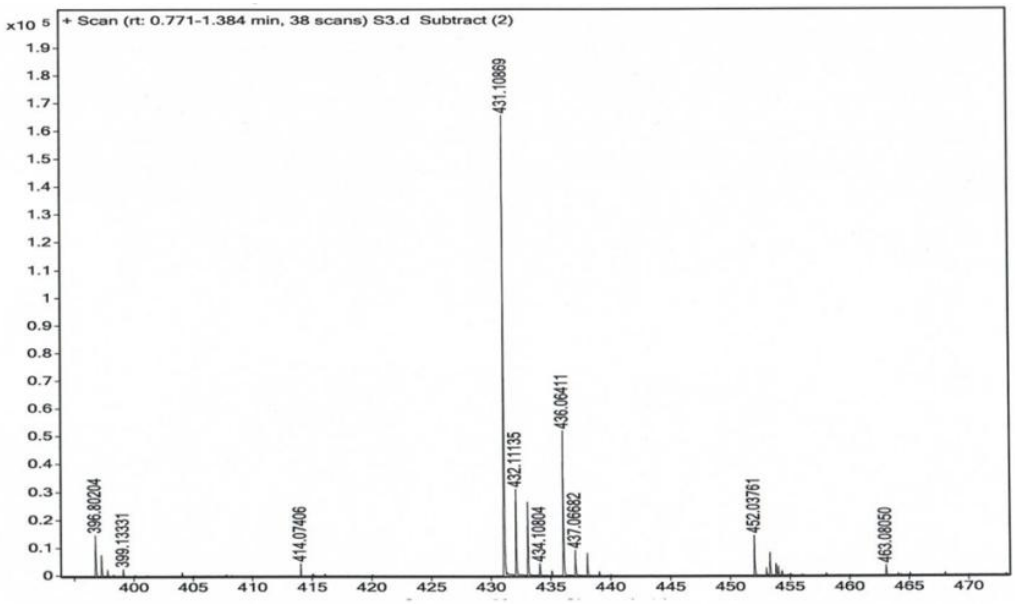


Figure S9. ^{1}H NMR (left) and ^{13}C NMR (right) of compound TSNO (up). HRMS spectrum of compound TSNO (down).

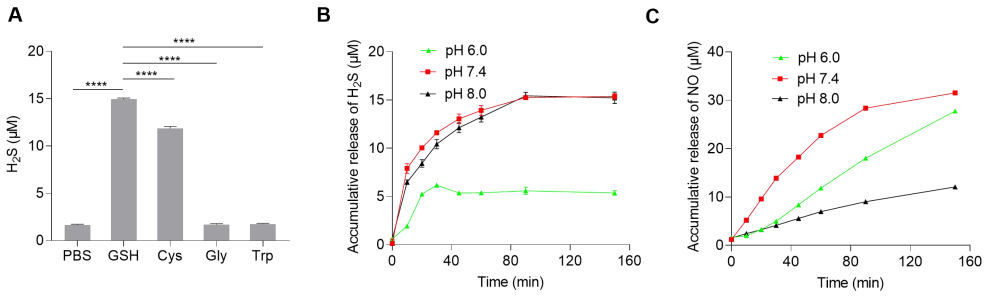


Figure S10. *In vitro* release of H_2S and NO from the TSNO prodrug. (A) H_2S release from TSNO with various thiol catalysts. (B) *In vitro* release of H_2S from the TSNO prodrug in the presence of GSH (100 μM) at various pH values (n=3). (C) *In vitro* release of NO from the TSNO prodrug in the presence of GSH (100 μM) and engineered A4-β-Gal^{H363A} (0.005 mg/mL) at various pH values (n=3).

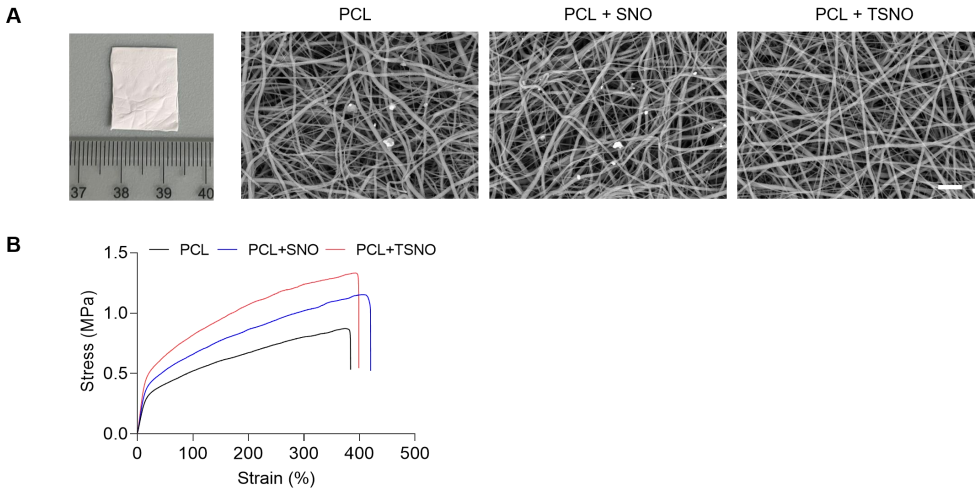


Figure S11. The characterization of TSNO-functionalized wound dressing. (A) Representative images of the wound dressing and its microstructure demonstrated by SEM (scale bar, 100 μm). (B) Characterization of the wound dressing in terms of mechanical properties.

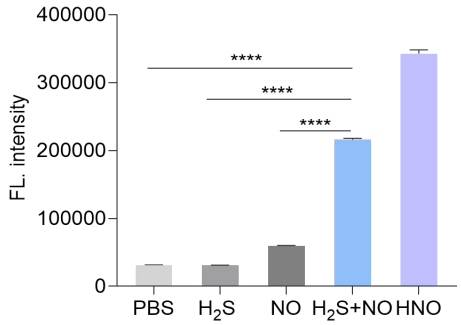


Figure S12. HNO production from the interaction of H_2S and NO. An HNO-specific fluorescence probe (10 μM) was co-incubated with the TSNO prodrug in the presence of GSH (100 μM) and engineered A4-β-Gal^{H363A} (0.005 mg/mL). Angeli's salt (an HNO donor) was used as a positive control, excitation wavelength 360 nm, emission wavelength 460 nm (n=3).

Table S1. Primer sequences of qPCR.

Gene name	Forward primer (5' to 3')	Reverse primer (5' to 3')
m-Gapdh	CCCTTATTGACCTCAACTACA	TGGTGAGGGGCCATCCACAGTCTTCTG
m-Pecam1	ACGCTGGTGCTCTATGCAAG	TCAGTTGCTGCCCATTCATCA
m-Angpt1	CACATAGGGTGCAGCAACCA	CGTCGTGTTCTGGAAGAATGA
m-Vegfa	CTGCCGTCCGATTGAGACC	CCCCTCCTTGTACCACTGTC
m-Kdr	TTTGGCAAATACAACCCTTCAGA	GCAGAAGATACTGTCACCACC

m-Mrc1	CTCTGTTCAGCTATTGGACGC	CGGAATTTCTGGGATTCAGCTTC
m-Arg1	CTCCAAGCCAAAGTCCTTAGAG	AGGAGCTGT CATTAGGGACATC
m-Il4	ATCCTGCTCTTCTTTCTCGAATGT	GCCGATGATCTCTCTCAAGTGATT
m-Il10	AGCCTTATCGGAAATGATCCAGT	GGCCTTGTAGACACCTTGGT
m-Nos2	GTTCTCAGCCCAACAATACAAGA	GTGGACGGGTCGATGTCAC
m-Il1b	AGCTCTCCACCTCAATGGAC	GACAGGCTTGTGCTCTGCTT
m-Il6	TCCATCCAGTTGCCTTCTTG	GGTCTGTTGGGAGTGGTATC
m-Tnf	ACGGCATGGATCTCAAAGAC	CGGACTCCGCAAAGTCTAAG