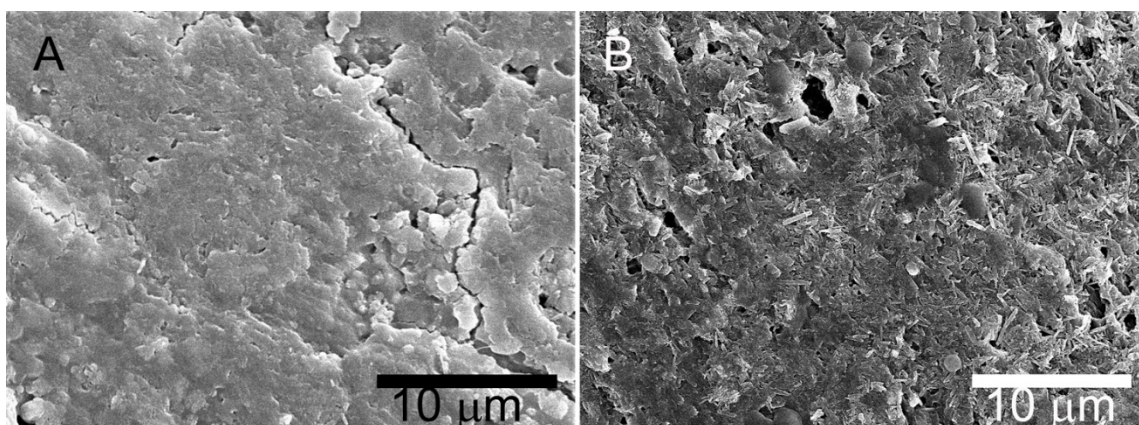
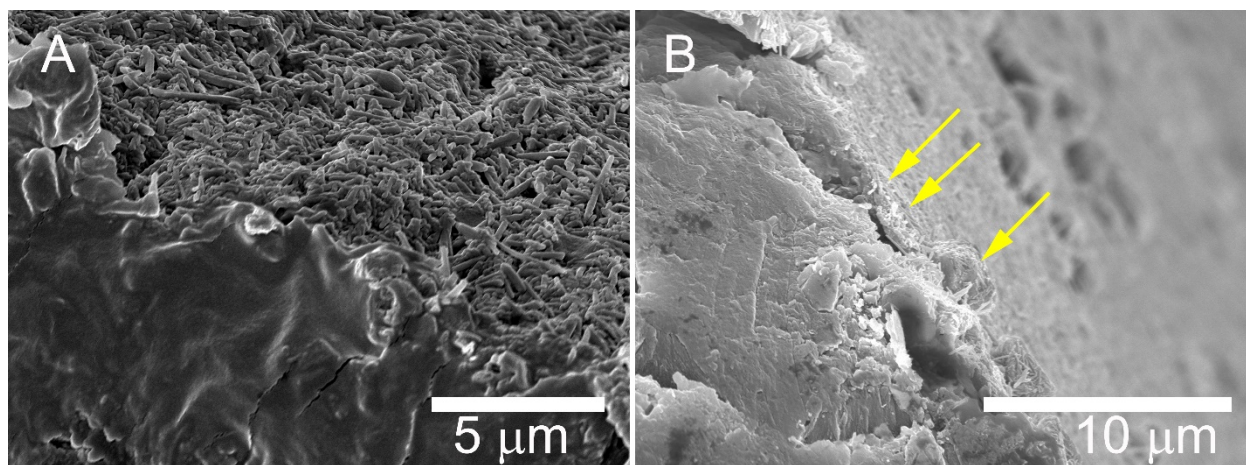


## Supplementary Materials: Clay Nanotube Immobilization on Animal Hair for Sustained Antilice Protection

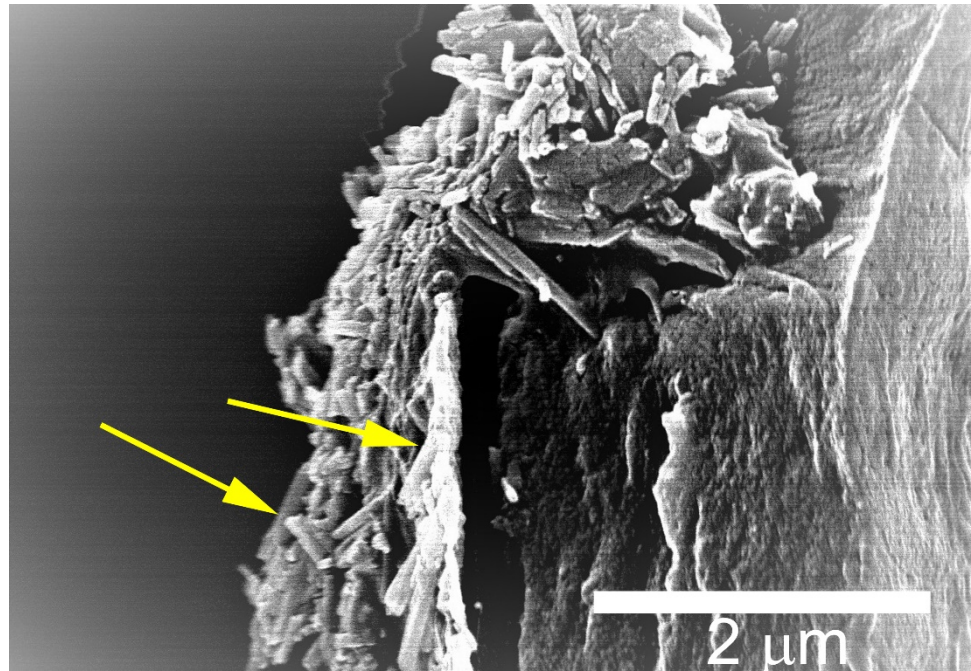
Naureen Rahman, Faith Hannah Scott, Yuri Lvov, Anna Stavitskaya, Farida Akhatova, Svetlana Konnova, Gölnur Fakhrullina, Rawil Fakhrullin



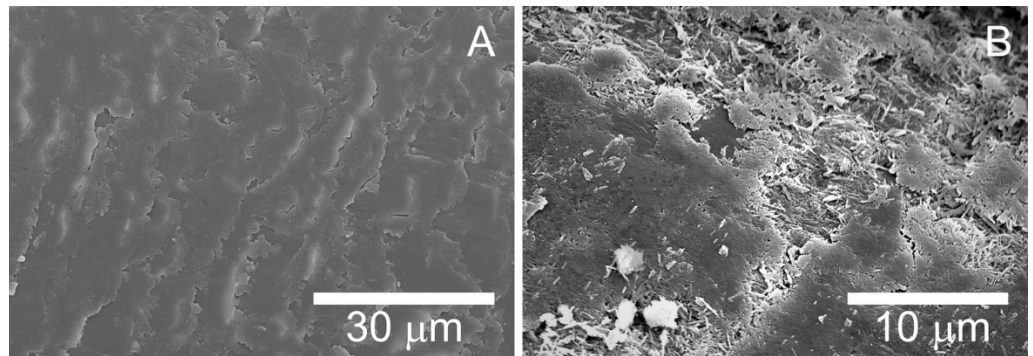
**Figure S1.** Self-assembly of halloysite clay nanotubes on acetone-washed (unwaxed) capybara hair surface: SEM images of the unwaxed capybara hair (A) and the surface is partially covered with HNTs (B).



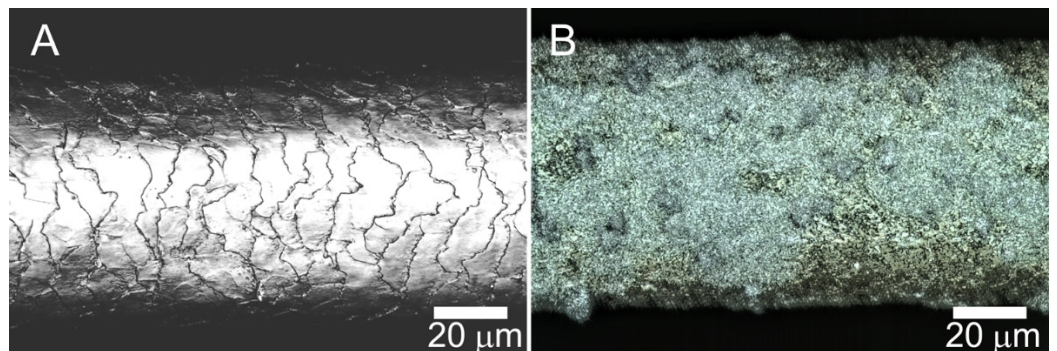
**Figure S2.** Cross-section image of halloysite coated pristine (A) and unwaxed (B) capybara hair-halloysites visible at the edges.



**Figure S3.** SEM cross-sectional image of halloysite coated guinea pig hair, halloysite tubes (arrowed) are visible at the edges.

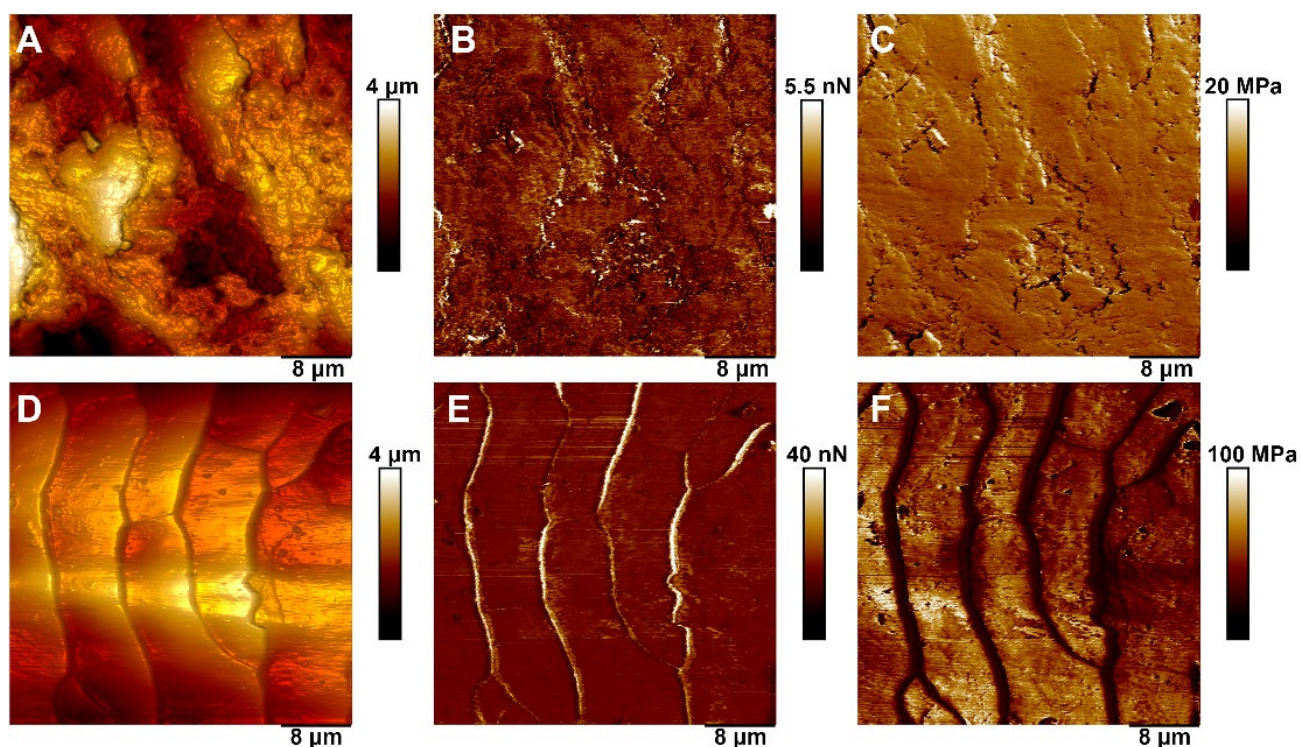


**Figure S4.** SEM images of pristine horse hair (A) and partially halloysite coated (B) horse hair.

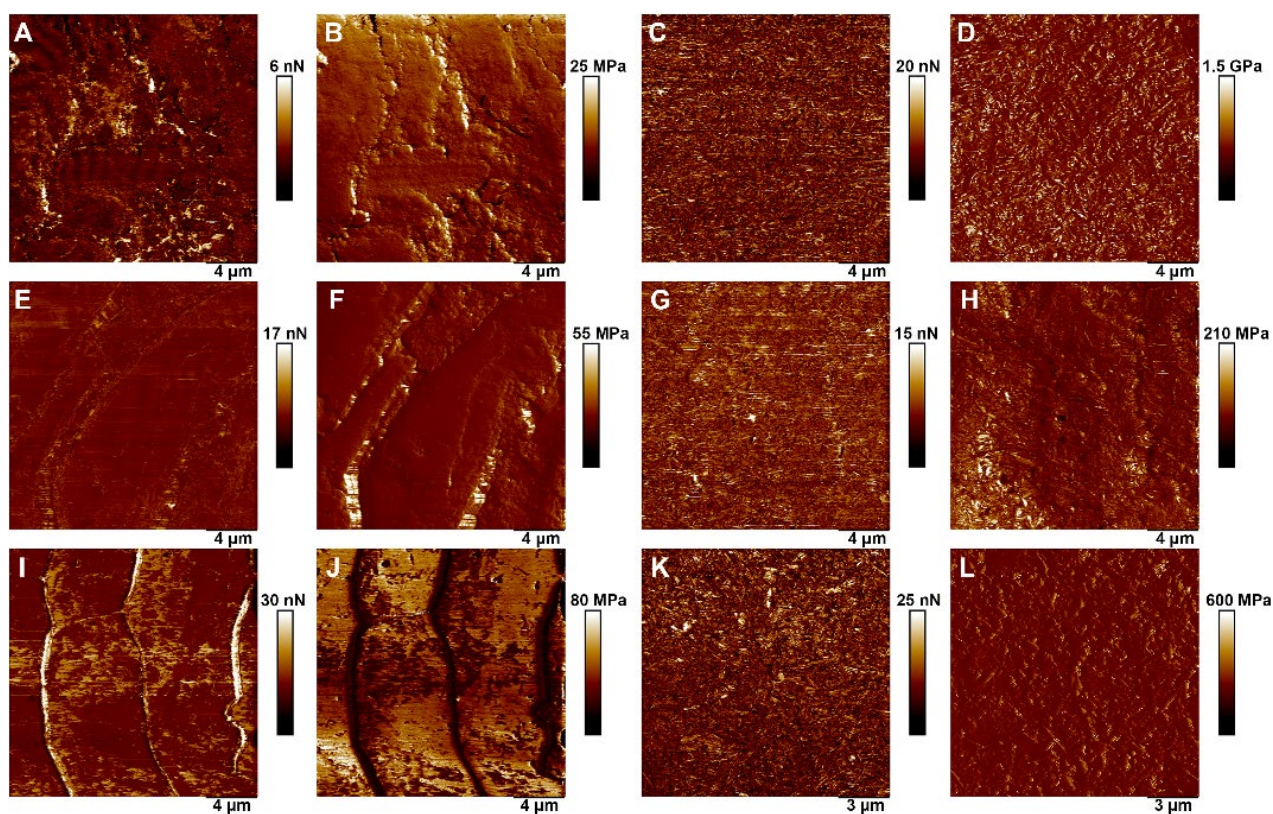


**Figure S5.** Confocal optical images of the pristine goat hair (A) and wax pre-treated goat hair coated with permethrin loaded halloysite (B).





**Figure S6.** AFM images of pristine capybara (A–C) and guinea pig (D–F) hair: topography (A, D); adhesion (B, E) and Young's modulus map (C, F).



**Figure S7.** Nanomechanical characteristics (adhesion, modulus) of the capybara and guinea pig hair surface before and after coating with halloysite nanotubes: (A–B) pristine capybara hair; (E–H) unwaxed capybara hair; (I–L) guinea pig hair; (A, E, I) adhesion and (B, F, J) Young's modulus of halloysite-free capybara and guinea pig hair; (C, G, K) adhesion and (D, H, L) Young's modulus of halloysite-coated halloysite capybara and guinea pig hair.

**Table S1.** Mortality response of drug - HNT treatment after one month after 1st and 2nd hair wash.

Experimental formulation	No of lice survived \ Time (h)				
	0	4	8	16	24
Hair treated with 0.5 % permethrin drug	10	1 ± 1	1 ± 1	0	0
Hair washed one time after 0.5 % permethrin treatment	10	5 ± 2	2 ± 1	0	0
Hair washed two times after 0.5 % permethrin treatment	10	7 ± 1	7 ± 1	6 ± 1	6 ± 1
Hair coated with permethrin - HNTs, no washing	10	2 ± 1	2 ± 1	0	0
Hair washed one time after permethrin-HNTs treatment	10	5	2 ± 1	0	0
Hair washed two times after permethrin-HNTs treatment	10	6	3 ± 1	1 ± 1	0