Title:	Nanochannel Mediated Electrical and Photoconductivity of Metal Organic Nanotubes
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Abstract:	The structural features of metal–organic frameworks (MOFs) are very tempting and have proven themselves to be promising candidates for different applications such as gas storage and separation, catalysis, sensing, magnetism, drug delivery, and so forth. The nanotubular structure of MOFs leads to a new class called metal–organic nanotubes (MONTs), which are structurally analogous to carbon nanotubes. Herein, we explored the electrical conductivity and photoconductivity of two isostructural MONTs, [Zn3(btc)2(μ3-OH) (DMF)]·H2O (Zn–Zn-btc) and (ZnNi2(btc)2(μ3-OH)DMF)·H2O (Zn–Ni-btc). Solvent activation, followed by thermal activation of Zn–Zn-btc and Zn–Ni-btc MOFs result in an increase of electrical conductivity by 3 and 2 orders, respectively. The remarkable increment in conductivity after evacuating the porous channels marks the significance of MONTs. The electrical conductivity of Zn–Zn-btc is 100 times higher than that of Zn–Ni-btc despite the fact that both are isostructural. The lower conductivity of Zn–Ni-btc is attributed to the low charge carrier density and mobility due to atomic mismatch. Zn–Ni-btc displays a decrease in conductivity with increasing temperature (above room temperature), which then starts to increase after 373 K, showing lattice vibration-mediated transport below 373 K and hopping-mediated electrical transport above 373 K. Whereas Zn–Zn-btc shows a continuous decrease in conductivity with temperature mainly due to the phonon-mediated transport mechanism. Both the compounds show a photoconductivity effect at room temperature. The blue light-induced photoconductivity of Zn–Ni-btc is almost 14% higher than that of Zn–Zn-btc. The photoswitching effect is shown by both the MONTs.
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