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Title:	Room temperature synthesis of new isoreticular 2D metal–organic frameworks of Co(II) and Ni(II) comprised of dual semiflexible neutral and anionic linkers, and their conversion to metal oxide nanomaterials
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Keywords:	Room temperature synthesis isoreticular 2D metal–organic frameworks Co(II) and Ni(II) comprised of dual semiflexible neutral and anionic linkers, and their conversion
Issue Date:	2022
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Abstract:	For a combination of a semi-flexible cycloaliphatic dicarboxylic acid and a bis(tridentate) polypyridyl ligand with a semirigid spacer, two new isostructural two-dimensional (2D) metal–organic frameworks have been obtained under ambient conditions in yields > 80%: {[Co2(cdc)2(tpxn)(H2O)2]·H2O}n (1) and {[Ni2(cdc)2(tpxn)(H2O)2]·CH3OH}n (2) (where, cdc = cyclohexane-1,4-dicarboxylate and tpxn = N,N'-(1,4-phenylenebis(methylene))bis(1-(pyridin-2-yl)-N-(pyridin-2-ylmethyl)methanamine)). Both 1 and 2 are characterized by elemental analysis, FTIR spectroscopy, thermogravimetric analysis (TGA), and single crystal X-ray diffraction. Each metal center in 1 and 2 is hexacoordinated with an N3O3 environment and contains a coordinated water molecule. The semirigid bis(tridentate) ligand binds with two metal ions and forms the dimetal subunit, which is extended further through two cdc2- carboxylates forming a 2D supramolecular net with a hcb topology. The dimension of the six-membered ring in the net is 19.500 Å × 23.013 Å and 19.423 Å × 22.903 Å (including van der Waals radii) for 1 and 2, respectively. Additionally, the isostructurality of the reported Co(II) and Ni(II) compounds was revealed using Hirshfeld surface analysis supported by quantitative intermolecular interactions. Based on the thermal behavior established by TGA, the corresponding metal oxide nanomaterials (Co3O4 and NiO for 1 and 2, respectively) were fabricated under the template-free and surfactant-less direct calcination at 500 °C.
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