

# Oxygen-molecule spin-nanotubes constructed by physisorption into a nanoporous medium

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We succeeded in controlling gas-liquid-solid transitions and in constructing "spin-nanotubes (SNTs)" based on antiferromagnetic correlations by physisorbing oxygen molecules ( $O_2$ ) into the nanosize pores of a mesoporous medium MCM-41 while also manipulating the adsorption quantity. The phase diagram of  $O_2$  physisorbed into MCM-41 presents many common characteristics with that of  $O_2$  layers physisorbed on graphite substrates. In the present case, experimental verification of the antiferromagnetic square lattice in the liquid phase of the monolayer proved the formation of  $O_2$  SNTs. The present  $O_2$  SNT is an experimental example of the successful construction of SNT.

