**Significance:** A palladium nanocatalyst (PdNP@1) prepared by a cage-templated synthesis method (eq. 1), catalyzed the Suzuki–Miyaura coupling of phenylboronic acid with iodo- or bromobenzenes under microwave irradiation to give the corresponding biaryl products in 96–99% yield (eq. 2).

**Comment:** PdNP@1 was characterized by means of UV–Vis, $^1$H NMR (DOSY), HR-TEM, and EDS analyses. In the reaction of 4-iodotoluene with phenylboronic acid, the catalyst was reused three times without loss of its catalytic activity. The reactivity of PdNP@1 was higher than that of commercially available palladium catalysts such as Pd(PPh$_3$)$_4$ or Pd/C.