One important aspect of modern chemistry is directed towards the synthesis of complex nanomolecules that exhibit specific properties for applications in materials science and biology. However, the preparation of complex nanostructures combining the required functional groups remains often difficult and requires a large number of synthetic steps thus limiting both their accessibility and applicability. Our research group has shown that the preparation of easily accessible nanoscaffolds allowing for the grafting of one or more molecular entities is an appealing strategy to generate sophisticated nanomolecules. Overall, one of our main concerns is to increase the complexity of the molecular structures without increasing the synthetic difficulties. This is an important challenge for synthetic organic chemistry in general. As part of this research, we became interested in pillar[5]arene as a compact scaffold for the construction of nanomaterials. Pillar\(n\)arenes are a new class of macrocycles that are efficiently prepared from readily available building blocks. The combination of pillararene chemistry with materials science is appealing as the unique structural features of pillar\(n\)arenes (multivalency, shape and chirality) affords new materials that may be not produced by using other macrocyclic hosts. Our latest advances in this particular field will be presented.