

Asymmetric Michael addition catalyzed by a cinchona alkaloid derivative non-covalently immobilized on layered inorganic supports

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Abstract A study on the asymmetric Michael addition of a fluorine containing carbon nucleophile to β -nitrostyrene was carried out to find an easily obtainable cinchona alkaloid derivative, which provides high stereoselectivities, and may be conveniently immobilized over inorganic materials to obtain efficient chiral heterogeneous catalysts. It was shown that high enantioselectivities are reached in the addition of ethyl 2-fluoroacetoacetate catalyzed by β -isocupreidine accompanied by good diastereomeric ratios. This cinchona derivative prepared in one step from quinidine was immobilized by cation-exchange between the layers of an aluminum phyllosilicate, as evidenced by XRD measurements. However, due to the protonation of the tertiary amino group, the material lost its catalytic activity in the Michael addition. The immobilization of the deprotonated alkaloid over the particle surface of an anion exchanger layered double hydroxide resulted in an inorganic–organic hybrid material, with catalytic performance approaching that of the soluble organocatalyst. Upon reuse, gradual deactivation of this heterogeneous catalyst was observed due to the leaching of the organic material. However, using less polar media could increase the lifetime of the hybrid catalyst. The results of catalytic measurements indicated that the Michael addition might occur on the solid surface. Based on the catalytic behavior of the heterogeneous catalyst, bonding possibilities

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