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Earth abundant metals catalysts for bioplasticsproduction

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Abstract:
In the field of polymers access to a new generation of polymers from renewable resources with good biodegradability and at the same time keeping the high performance of the fuel-based polymers is paramount. In this context, one type of polymers that have attracted a lot of interest are polyesters derived from renewable cyclic esters such as lactide or butyrolactone. Besides, these polymers can be biodegradable and biocompatible and can show a wide range of applications.[1]

One of our ongoing research areas is focused in the preparation of main group metal complexes as catalysts for the Ring Opening Polymerization (ROP) of cyclic esters to generate biodegradable polymers. Within main group metals, aluminum stands out as the most abundant metal on Earth crust and also has well known catalytic properties, in fact recently aluminum is living a renascence as catalysts.[2]As well alkali metals such as Li, Na and K are particularly interesting not only for their abundance but as well due to their low toxicity.

We have prepared a series of aluminum and alkali metal complexes with phenoxide ligands that bear different substituents in the aromatic rings to assess their influence on the catalytic activity.[3]These compounds have shown to be very active in catalytic ROP processes of *rac*-lactide and ε-caprolactone and also in the ROP of a monomer quite reluctant to polymerization such as β-butyrolactone. Furthermore, to enlarge the family of polyesters from renewable feedstock a good strategy is to perform the copolymerization of anhydrides and cyclic ethers derived from renewable resources such as terpene epoxides. In these processes our compounds have also shown to be very active generating efficiently terpene derived polyesters.

References

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