FACILITATING CATALYST RECOVERY/REUSE/SEPARATION USING SOLUBLE POLYMERS

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Phase selectively soluble polymer supports for homogeneous metal and organo-catalysts will be described. Such supports quantitatively recover the catalyst and ligand after a single phase homogeneous reaction without any significant addition of solvent or other additives. In such chemistry, a solvent mixture is used that is miscible under the reactions conditions. This solvent mixture is chosen such that a temperature change or other perturbation produces a biphasic solid/liquid or liquid/liquid mixture. In the former case, the polymer support is typically designed to quantitatively precipitate and is recovered by centrifugation or filtration. In the latter case, the polymer is designed to be phase selectively soluble in one of the two liquid phases. Specifically the polymer microstructure is such that the polymer is soluble under the reaction conditions and phase selectively soluble during workup in the phase that does not contain the product. Thus, a gravity separation suffices to separate and recover the catalyst and ligand for reuse. Examples of how this chemistry facilitates the isolation of catalyst free organocatalysis and transition metal catalysis in polymerizations, ring closing metathesis, and cross coupling chemistry will be described. In addition, catalytic reactions where the products self separate from catalysts will be detailed.