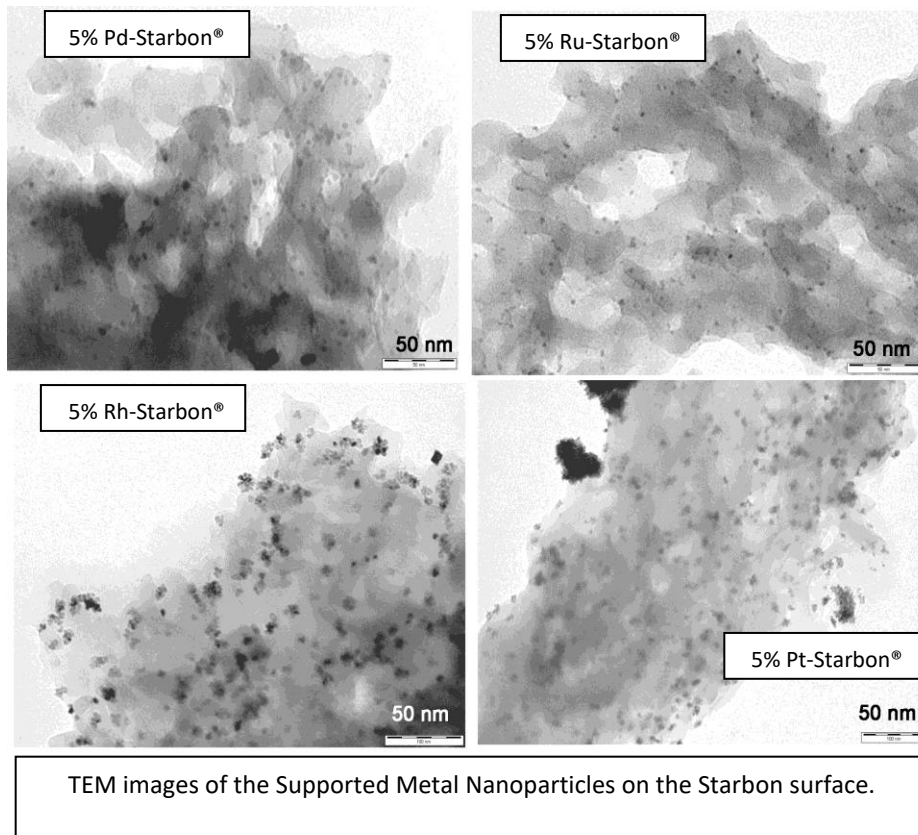




Starbon® Case Study IV - Nanoparticle support and catalysis



Nanoparticles find application in various fields including medicine, sensors, catalysis, paints, inks and coatings. Supported metal nanoparticles can play an important role in catalysis. Metal nanoparticles demonstrate unique properties compared to bulk metal. Use of expanded polysaccharides as supports has led to the control of both shape and size of nanoparticles.

Starbon® supported nanoparticles are:

- Prepared in one step
- Well dispersed
- Very small
- Stable

Materials prepared under the same conditions gave the following trend in terms of increasing particle size and decreasing dispersion:

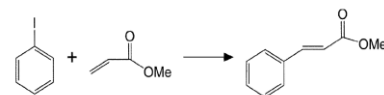
Ru > Pd > Pt > Rh > Ag

C–C coupling reactions such as Heck, Suzuki and Sonogashira are frequently used in the synthesis of pharmaceuticals. The properties of the metal nanoparticles reflect the unique porous environment that these novel materials provide, allowing access to a wide range of surface chemistries and thus facilitating the preparation of metal nanoparticles of a controllable size and nature. Materials are highly stable, active and reusable under various reaction conditions.

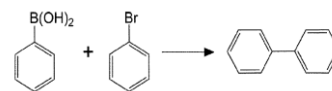
% Conversions and selectivities of C-C coupling reactions with 2.5% palladium on expanded starch

Reaction	Preparation solvent	XT (mol%)	S main product (mol%)	S homocoupling (mol%)
Heck	Ethanol	>90	>90	-
Suzuki	Acetone	>99	>95	-
	Ethanol	>95	>99	-
Sonogashira	Ethanol	>90	65	35
	Acetone	>95	60	40

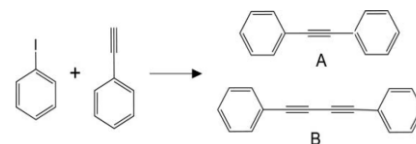
Other applications include direct conversion of the carboxylic acid components in fermentation broths including conversion of succinic acid to valuable products such as butanediol.



Heck coupling of iodobenzene and



Suzuki coupling of bromobenzene



Sonogashira coupling of iodobenzene