

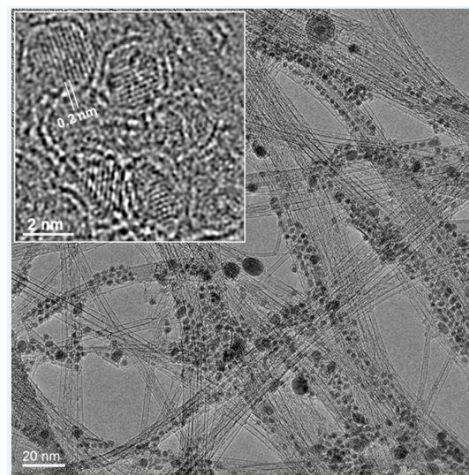


## Sustainable platinum group metal free catalyst materials, SUPER

Platinum group metals (PGM) fall into [the EU critical raw materials](#) because of their numerous current and emerging applications as well as political and economic risks related to their production and utilization. Thus, the use of PGMs is associated with some critical challenges. In-depth studies have indicated that the presently known platinum reserves are overexploited and this limits adoption of new Pt utilizing technologies. Moreover, almost all the global PGM reserves are situated outside the EU ([95% in Republic of South Africa](#) RSA, Russia 2%).

In the SUPER project, we use a modern approach of combining computational and experimental chemistry for selecting materials for synthesis, characterization and reaction studies to develop readily recyclable versatile nanostructured catalysts to replace PGMs or other critical metals with new nanomaterials. These nanomaterials contain only abundant elements such as carbon (not graphite) and certain inexpensive transition metals (e.g. Fe, Mn, Ni). It is illustrative to compare the price of Pt and Fe catalysts: Similar size nanoparticles of Pt and Fe cost 850 EUR/g and 1.5 EUR/g, respectively. It is clear that the cost, or abundance, of Fe does not limit the utilization of Fe based catalysts.

Our aim is to develop and assess catalyst materials potentially applicable for various chemical industry processes including the Fischer-Tropsch (FT) and hydrogenation reactions for hydrocarbon production. We are particularly interested in reactions related to conversion of biomass to biofuels because this new application with enormous growth potential has clear need for development of new catalyst materials. Moreover, electrocatalysts for emerging clean energy technology applications such as fuel cell and hydrolyser are considered.



*Catalyst material comprising of graphene encapsulated iron nanoparticles on carbon nanotube support.*

### Research team:

Prof. Kari Laasonen  
Computational chemistry  
Aalto University  
School of Chemical Technology  
Department of Chemistry  
PO Box 16100, FI-00076 Aalto  
Espoo, FINLAND

Prof. Esko I. Kauppinen  
Carbon nanomaterials  
Aalto University  
School of Science  
Department of Applied Physics  
PO Box 15100, FI-00076 Aalto  
Espoo, FINLAND

Assoc. Prof. Tanja Kallio  
Aalto University  
School of Chemical Technology  
Department of Chemistry  
PO Box 16100, FI-00076 Aalto  
Espoo, FINLAND