Background of the project

Ten years ago, a revolution began that has taken materials science community by storm: the discovery of how to prepare and process graphene, the first of a large family of monoatomic, 2-dimensional materials. Graphene is the thinnest compound known to man at one atom thick (a million times thinner than a human hair), the strongest compound discovered, the lightest material known (with one square meter coming in at around 0,77 milligrams) and flexible. Graphene can be thought of as a giant molecule that is available for chemical modification, with potential for a wide variety of applications, ranging from electronics to composite materials. Some products based on graphene-polymer composites are already commercial, in particular in the field of composites (tennis rackets, helmets etc.).

In 2010 A. Geim and K. Novoselov were awarded the Nobel Prize in Physics for these discoveries in a material that is “all surface and no bulk”. In 2013, Chalmers University became the leader of one of the largest European research projects ever launched, dedicated to graphene: the Graphene Flagship https://graphene-flagship.eu/ planned to endure till 2023.

Now, Chalmers aims at launching a new research line dedicated to the production of novel composite structures based on graphene and similar 2-dimensional materials.

Objective of the work

The objective of this work is to develop innovative techniques to process graphene on complex substrates, such as metallic and polymeric powders and foams. Graphene can nowadays be produced on large scale with different methods, and even grown directly on metals at high temperature. However, processing graphene with other materials such as metals, ceramics and glass is still challenging.

The objective of the work is thus to invent new techniques to create graphene composites for possible applications in the fields of composites, metallurgy or energy storage.

Description of the work

The student will be trained on how to perform literature and patent search to obtain the latest information in the bursting field of graphene composites research. He/she will then perform a thorough literature research collecting data published by academic and industrial organizations related on the project topic.
Then, he/she will deposit commercial graphene products on metal and polymeric substrates (flat surfaces, powders and foams) using different techniques. He/she will also assist Chalmers researchers in the characterization of the materials produced using advanced characterization techniques.

**Qualification**
We are looking for an experimentally oriented student with a good scientific background in material science and chemistry, and a strong curiosity for nanotechnology. The student should possess good practical skills, enjoying working in a chemical lab, setting up new experiments and reading scientific works.

**Supervision**
The work will be supervised by Prof. Vincenzo Palermo (Palermo@chalmers.se) from the Department of Industrial and Materials Science, Chalmers University of Technology. Extent and time plan: 30 hp master thesis project, starting in mid-January 2018 till June 2018

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