

Metal Organic Frameworks in MOFilter Face Masks

Mohamad Hmadeh, Kamel Ghali, Jamal Hoballah

Department of Chemistry

Department of Mechanical Engineering

Department of Surgery

American University of Beirut

The 2019 novel coronavirus known as SARS-CoV-2 has spread rapidly since its identification in a 55 years old patient in Wuhan, Hubei province in early December 2019. This virus belongs to the beta coronaviruses family and have caused the death of more than 410,000 people worldwide and more than a 30% loss of economic activity in mature markets. Although no coronavirus vaccine has been developed to protect the body against the disease, scientists and researchers around the world are working on developing new vaccines and chemicals as well as using drugs and agents that have been used before in the treatment of similar diseases such as malaria and tuberculosis in the treatment of Covid-19 patients. Here we present a new method that can be used to contain the virus before reaching the host cells in the human body. This method is based on the synthesis of a new class of crystalline materials known as metal organic frameworks that will be inserted between non-woven fabrics in face masks to form what is known by MOFilter masks. The open metal sites of these materials will coordinate and bind to the polypeptide encoded by the ORF1ab/ORF1b of SARS-CoV2 at the surface to prevent the virus from entering and replicating in the body. Furthermore, salts (e.g. NaCl and CaCl₂) can be encapsulated within the pores or on the defected sites of the proposed MOFscoated cotton in order to neutralize Covid-19 at the surface of the mask. The proposed MOFs will be synthesized via a reaction diffusion process which was recently developed method in our lab. Besides its novelty, this method is environmentally friendly, scalable and allows us to produce MOF crystals with controlled size and composition. The MOFilter will be tested for capturing and filtering pathogenic particulate matter. Other tests related to the wearer's comfort including the permeability to water vapor and CO₂ of the mask will be performed as well.