Particle emissions from cutting of concrete

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Concrete is the material most commonly used after water in the world which has always lead to a high consumption of raw materials. In addition it leads to enormous CO^2 emissions. The production of cement is responsible for 6.5% of the total carbon dioxide emissions. That is about three times the amount of carbon dioxide emitted by global aviation.
Due to corrosion the service life of steel-reinforced concrete structures remains far behind earlier expectations. The vision of the project C³ - Carbon Concrete Composite is to establish a new way to build by using concrete reinforced by carbon fibre composite. This carbon concrete can replace steel in the long term. Since carbon does not rust, most of the concrete, which is only used to protect the steel from corroding, can be spared. Carbon reinforced concrete is sustainable, environmentally friendly, saves material and weighs less. This offers a wider variety for architectural designs.
Nevertheless materials containing fibres like carbon composites can come under criticism for the release of fibres during handling and machining. Typical processes for the machining of concrete are cutting and core drilling. Without water drilling fluid circulation these processes emit a huge amount of dust, leading to high particle concentrations in the vicinity of the machining process. Due to the fact, that the carbon reinforced concrete contains fibres, the dust aerosol maybe does as well.

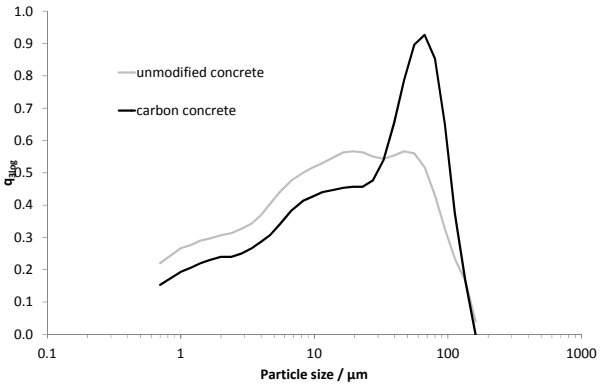

Figure 1. Size distribution of dust particles generated by cutting concrete with and without carbon fibres.

Therefore a subproject of C^3 addresses the question, to what extent the dust particles emitted during the machining of carbon concrete can show adverse health effects. This is done using several toxicological and physical measurement techniques.

The contribution presents the actual state of knowledge of the project. It discusses the results of different measurement techniques employed to determine the size distribution of dust particles during cutting of concrete and the influence of sample preparation and dilution on the measured size distribution.

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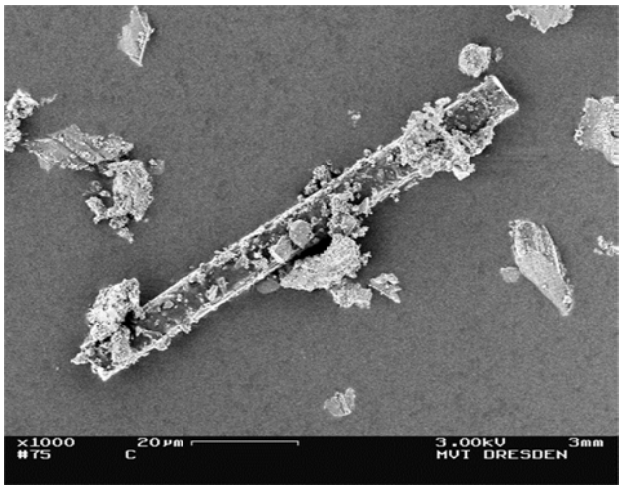

Figure 2. Fragment of a carbon fibre precipitated from dust emitted during cutting concrete.