

Manufacturing, properties and application of nano-sized superhydrophobic spherical silicon dioxide particles as a functional additive to fire extinguishing powders

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The particles morphology was studied using a QUANTA 650 FEG scanning electron microscope (Fei, The Netherlands). Octane Elite EDS System (AMETEK Materials Analysis Division, US) was used for analyzing the elemental composition of fire extinguishing powder (FEP) samples.

EDS analysis of powder compositions confirms the presence of ammonium phosphates and silicon dioxide, which plays the role of a functional additive. The presence of ammonium sulfate in all samples can be explained by its impurity in the composition of industrially produced ammonium phosphates, admitting, according to the standard, the content of 2.5 wt% sulfur [Regulation (EC) № 2003/2003 of the European Parliament and of the Council of the council relating to fertilisers. – Official J. European Union, 2003. – P. 194]. Also, ammonium sulfate is often used in the production of fire extinguishing powders to reduce moisture absorption, since it has low hygroscopicity and increases the bulk density of the compositions.

It is important to note the increase in the proportion of sulfur in the samples of fire extinguishing powders from FEP1 to FEP3, as well as the presence of barium in FEP2. The latter may be due to the use of barium sulfate in the composition instead of ammonium sulfate.

The high carbon content is related to the substrate material and was not taken into account in the analysis.

Figure S1. SEM (a, b) and EDS (c) images of ammonium phosphates/superhydrophobic silica (FEP+NS).

Figure S2. SEM (a, b) and EDS (c) images of FEP1 (Vekson 50 ABC EN).

Figure S3. SEM (a, b) and EDS (c) images of FEP2 (Adex ABC).

Figure S4. SEM (a, b) and EDS (c) images of FEP3 (Glutex ABC).

Figure S5. Test Fire for class B (flammable liquids).

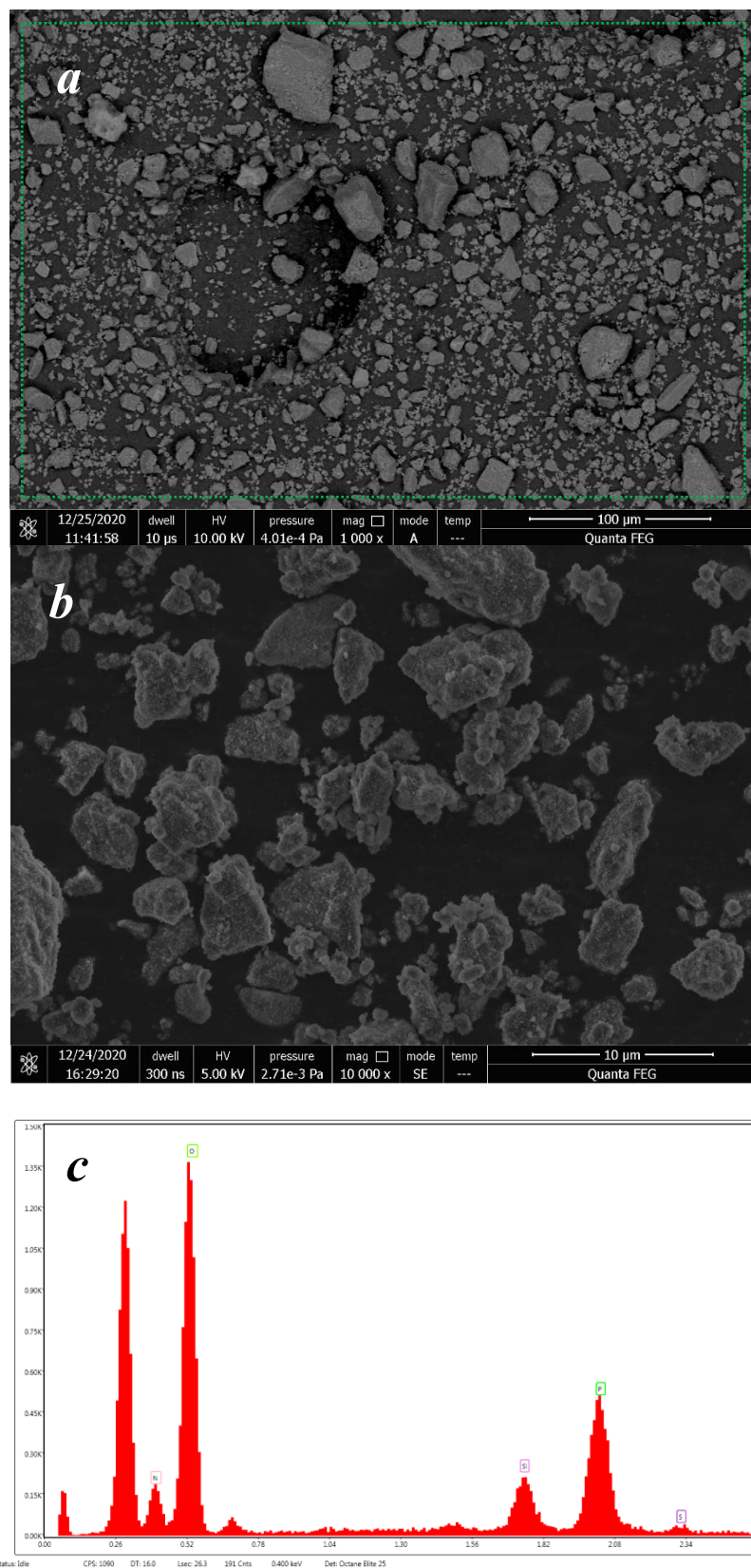


Figure S1. SEM (a, b) and EDS (c) images of ammonium phosphates/superhydrophobic silica (FEP+NS)

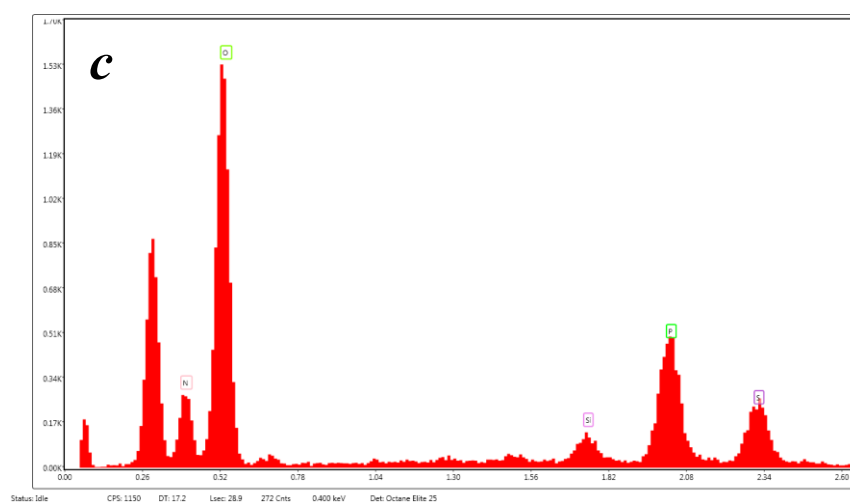
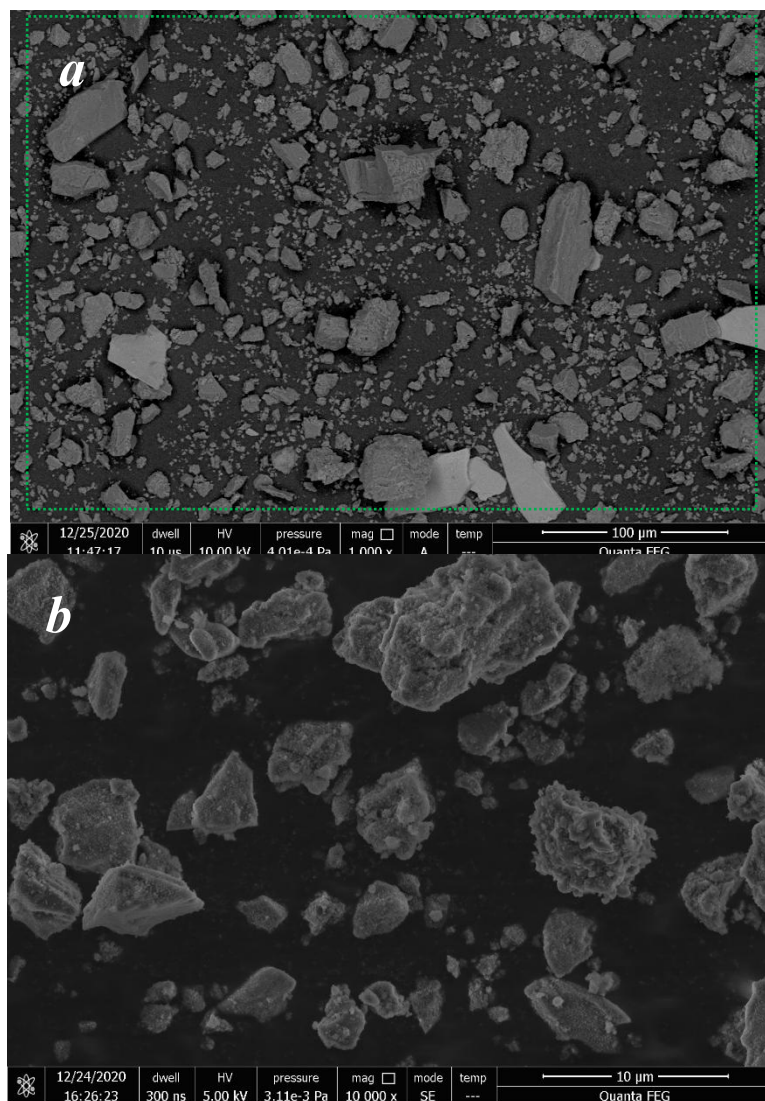


Figure S2. SEM (a, b) and EDS (c) images of FEP1 (Vekson 50 ABC EN)

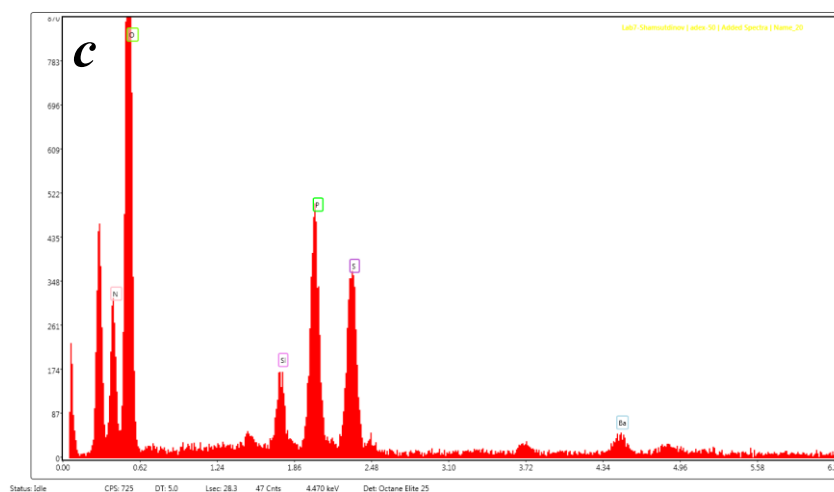
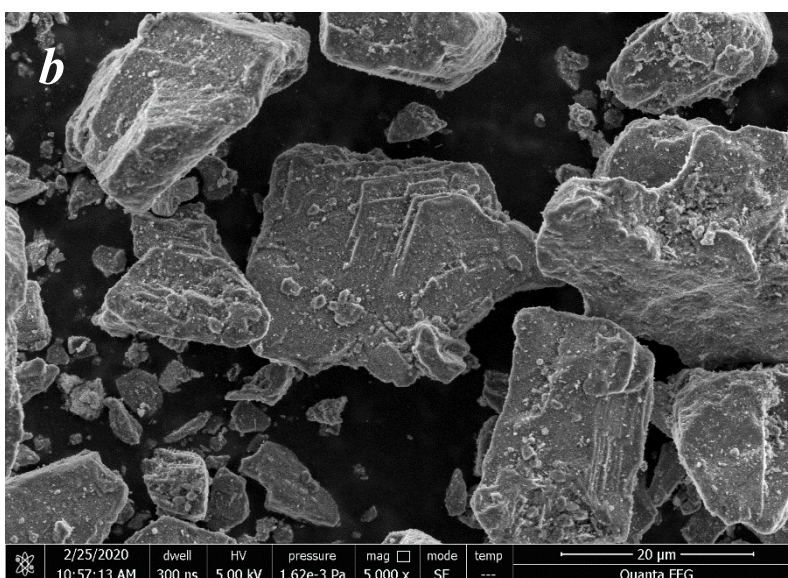
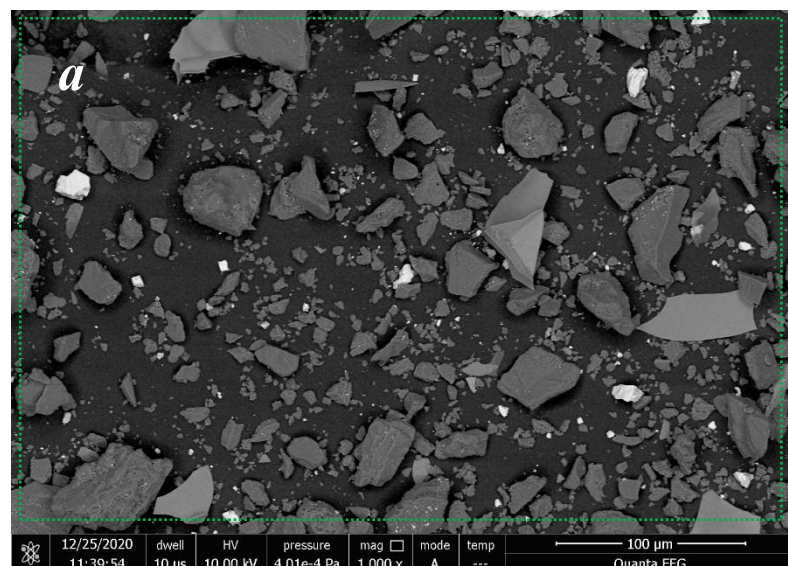


Figure S3. SEM (a, b) and EDS (c) images of FEP2 (Adex ABC)

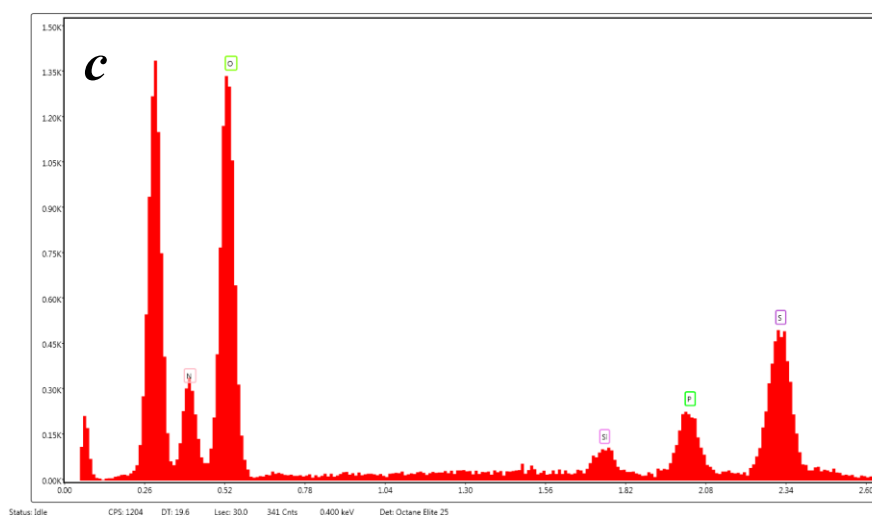
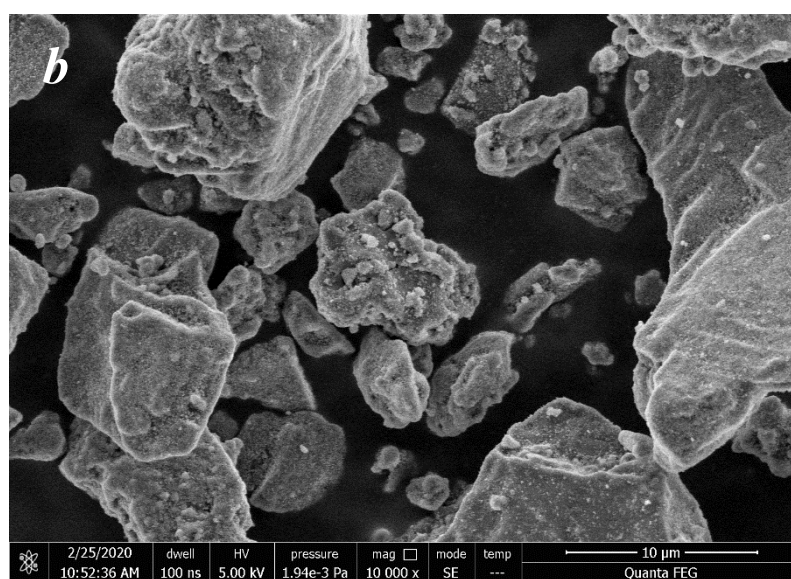
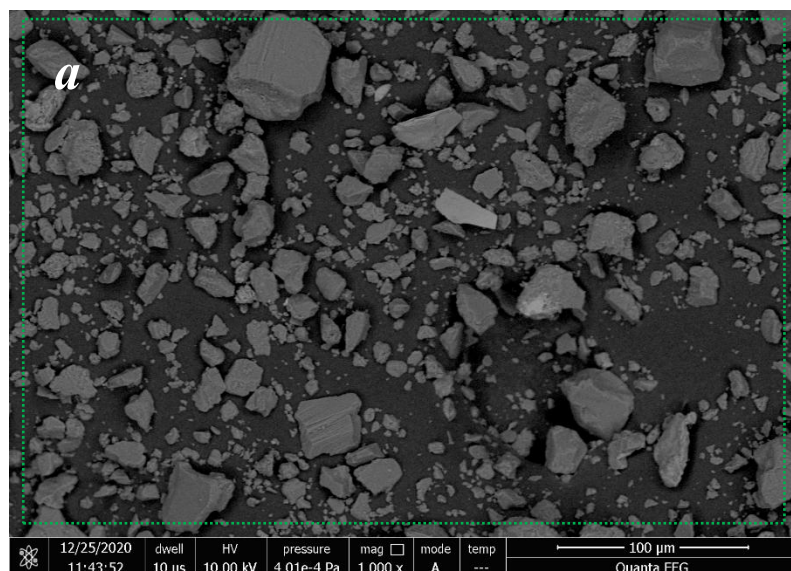


Figure S4. SEM (a, b) and EDS (c) images of FEP3 (Glutex ABC)



Figure S5. Test of an extinguishment of a class B fire (gasoline, area 1.75 m²) using a fire extinguisher (volume 2.5 L) with FEP sample.