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Tuning of the graphitic carbon nitride synthesis using the design of experiment method

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Graphitic carbon nitride represents one of the most studied photocatalyst for different applications. The band gap of g-C_3N_4 is 2.7 eV what means this photocatalyts is active also in a visible part of spectra. There are different procedures for g-C_3N_4 synthesis and the thermal polymerization of melamine is one of the most often used. Thermal polymerization is usually performed by calcination of melamine in semi-closed crucible in a static air atmosphere in a furnace. The reported calcination temperature ranges from 500 – 650°C as well as the reported heating rates and holding times differ significantly. The requirements for the final g-C_3N_4 include high photodegradation activity which can be reached only by proper setting of the calcination parameters. Design of experiment (DOE) method represents powerful tool how to plan the calcination experiment if the factors and their levels are defined. In the case of melamine calcination, we set five factors (temperature, heating rate, holding time, cooling speed and weight of the melamine) and for of these factors we defined two levels (minimum and maximum). Using statistical SW Minitab, we obtained half testing plan and performed the calcination experiments. As the output we set the yield of the final product and photodegradation activity of the final product against azo dye acid orange 7. The evaluation of the measured and calculated data enabled to define the effects of the selected factors and their levels on the defined outputs (yield and photodegradation activity). This work was supported by the Czech Science Foundation (project No. 16-10527S).

Biography

Vlastimil Matějka has completed his PhD from VŠB-Technical University of Ostrava and was working as associate professor at this university. In period 2014 – 2017 was working in Advanced R&D department of the company Brembo S.p.A. Since 2018 he is working as the associate professor at the VŠB-Technical University of Ostrava.

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