Forschungsbericht 292

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Untersuchungen zur Zündwahrscheinlichkeit und Datenanalyse zur Erfassung der Einflussgrößen mechanisch erzeugter Stahl-Schlagfunken in explosionsfähigen Brenngas/Luft-Gemischen

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Mechanically generated impact sparks are a potential ignition source in explosive atmospheres. A great number of mechanical and procedural chemical reactions are the reason of a complex interaction of the influencing variables. The influence of the ignition probability is only little known.

The summary of the statistically collected characteristics of mechanically generated impact sparks is a stochastic process, but the number and the oxidizing characteristic of the separated particles and the amount of the kinetic impact energy are the important influence of the ignition probability.

Empirical studies and the review to the BAM science report 279 represent for the first time and statistically firm the ignition probability of mechanically generated impact sparks for homogeneous ferritic steel pairing in the impact range from W = 3 Nm to 277 Nm. Furthermore it shows the ignition probability from separated not oxidized but increased temperature sparks generated through high-energy impacts (≥ 190 Nm) in hyperstoichiometric air/gas-mixture. Whereas the study clearly shows a correlation between impact energy and ignition probability and between impact energy and number of separated particles, it doesn’t statistically clearly show a correlation between impact energy and individual values (like number, dimensions, possible oxidizing process, oxidizing time an oxidizing characteristics). Also a realized Principal Component Analysis (PCA) taking into account the interaction between the summary of the number of influencing variables, shows no specific combination of measurable properties of the particles correlating with a significant increase of the ignition probability.