Unnamed Article

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**Title:** Half life sparkles

**Abstract:** *summary of methods and results*

We studied the distance distribution of the sparks and the distance distribution of the splitting produced from an angle grinder applied on steels of different carbon concentration using a simple set up and a high-speed camera. Using an image analysis software, ImageJ we found out that both the distance distribution of the sparks and the splitting follows an exponential distribution with a characteristic length that increases with the force applied.

**Introduction:** *motivation,key physical mechanisms and theoretical arguments,Reference*

Sparks are produced when an angle grinder is applied on metals. These sparks are originally metal composites that possess high energy and high temperature which oxidize in air, releasing light energy by blackbody radiation. These hot sparks eventually cool down and becomes undetectable when the rate of convective cooling(equation) outweighs the decreasing rate of oxidation due to the slow diffusion(equation) of oxygen through the growing metal oxide layer on the surface of the sparks.

As the sparks fly in air, it is possible that the sparks separates into many smaller sparks which we will call this phenomenon: Splitting.

Splitting occurs when the pressure of  carbon dioxide formed in the sparks overcome the metal oxide layers (cite source).  Carbon in steels plays an important role in splitting as splitting is almost absent in low carbon steels.

The diverse characteristics namely, the distance, the behavior and the color of the sparks produced from different metals are well known and are used in the studies of metallurgy to identify metals(cite source). However, little is known about the distance distribution of the sparks and the splitting. Hence, the goal of this study is to find out the two distance distribution and how the different parameters affect them.

Method: *diagrams and descriptions or reference of any apparatus or equipment used*

We conducted the experiments using 3 different steel bars with different carbon concentration: low carbon(<0.1%), medium carbon(0.16-0.18%) and high carbon(1.10-1.20%). The set-up is simple in which on one end of the room, we fix the angle grinder and the steel bar using a clamp and a tripod stand against a black background and about 1 metre away, we use a high speed camera which takes 1000 images per second to record the whole process. To ensure that a constant force is always applied on the metal bar as it is being cut,we hanged a mass on one end of the bar.This method also allow us to control the force applied and we used 3 different forces namely 50N, 75N and 100N.

The video were then analysed using ImageJ by applying batch processing of the function “Find Maxima” to identify the sparks. The distance of the sparks is calculated by taking the contact point between the angle grinder and the metal bar as the reference point.

Results: *Graphs and interpretation*

Discussion: *Compare with existing theories, Limitations and possible improvement* s

**Dead End**

**Conclusion**

**Reference**