fonic acids, which may lead to termination of the actual reaction for preparing the alkane sulfonic acid and further to impurities, formation of side products and poor yields based on sulfate trioxide and methane.

It is thus the object of the present invention to provide an industrial process for the valorization of alkanes to alkane sulfonic acids. A particular problem of the invention is to provide such a process for the valorization of methane to methane sulfonic acid (MSA). The process should avoid by-products and be equimolar with respect to the educts, sustainable within the meaning of the twelve principles of Green Chemistry as well as economically feasible.

In an aspect, there is provided a method for the production of alkane sulfonic acids, especially methane sulfonic acid, from an alkane, especially methane, and sulfur trioxide, comprising a step of reacting a carbocation of the alkane, especially a carbocation of methane, with sulfur trioxide such that the alkane sulfonic acid is formed.

In another aspect, there is provided the use of a carbocation for the production of an alkane sulfonic acid, especially methanesulfonic acid.

In another aspect, there is provided a method for the production of alkane sulfonic acids, especially methane sulfonic acid, comprising the following steps

i . Providing sulfur trioxide

ii . Providing an alkane, especially methane

iii . Providing a pre-catalyst, wherein the pre-catalyst comprises a hydrogen peroxide derivative

iv. Activating the pre-catalyst by reaction with a super acid, especially SO_3 in H_2SO_4

v. Reacting the pre-catalyst, the sulfur trioxide and the alkane in a reactor at a temperature of 50°C or below

vi . Separating alkane sulfonic acid, especially methanesulfonic acid, from the reaction mixture.

In a first embodiment the problem is solved by a method for the production of alkane sulfonic acids, especially methane sulfonic acid, from an alkane, especially methane,

and sulfur trioxide, comprising a step of reacting a carbocation of the alkane, especially a carbocation of methane, with sulfur trioxide such that the alkane sulfonic acid is formed.

Surprisingly it has been found that alkane sulfonic acids in high yields and with hardly any undesirable side products can be obtained when a carbocation of the alkane is employed. The inventive method particularly differs from methods of the prior art in that an ionic pathway is employed to produce alkane sulfonic acids. The inventive method thus circumvents the involvement of radical chain reactions, which usually lead to the formation of several different byproducts. These by-products are not observed in the method according to the present invention .

Furthermore, the reaction can be carried out at temperatures, where radical chain reactions do not take place as observed in the prior art where high temperatures are required. The inventive process can for example be carried efficiently out at room temperature or at about 30°C.