ENERGETIC EVALUATION OF AMMONIA SYNTHESIS USING A COAXIAL DIELECTRIC BARRIER REACTOR

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A double dielectric barrier coaxial reactor has been used to synthesize ammonia from nitrogen and hydrogen using argon as a carrier gas. This process has the advantage over the regular Haber process of not requiring very high pressures to carry out the reaction and being scalable to small production, attractive for self-consumption on a small agricultural operation.

The ammonia quantification is done using a colorimetric technique based on the Berthelot reaction, complemented with mass spectrometry using a differentially pumped quadrupole mass analyzer. In addition, optical spectroscopy measurements done on the discharge confirm the presence of ammonia in the system. Thanks to the very high sensitivity and selectivity of the colorimetric technique and the availability of complementary diagnostic techniques, ammonia production rate measurement is reliable, so good estimates of specific energy expenditure for the ammonia synthesis can be calculated to complement the existing values in the literature [1,2], and compared to that of the chemical reaction step on the standard Haber process.


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