MICROWAVE PHOTOCHEMISTRY

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While microwave chemistry already received widespread appreciation by chemical community [1], there is considerably less information about the microwave radiation effect on photochemical reactions. A combined chemical activation by two distinctive kinds of electromagnetic radiation, microwave (MW) and ultraviolet/visible, is covered by the field simply called *microwave photochemistry* [2-4]. Energy of MW radiation is considerably lower than that of UV radiation, thus it is not sufficient to disrupt bonds of common organic molecules. We can therefore anticipate that it is essentially photoinitiation what is responsible for a chemical change and MW radiation subsequently affects the course of the reaction. A simultaneous UV/VIS and MW irradiation of molecules may affect the course of a reaction by various mechanisms at *each* step of the transformation [5].

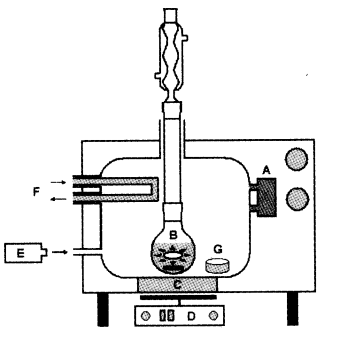

Figure 1. *A modified MW oven for microwave photochemistry experiments. A - magnetron; B - reaction mixture with EDL and a magnetic stir bar; C - aluminum plate; D - magnetic stirrer; E - infrared pyrometer; F - circulating water in a glass tube, G - dummy load inside the oven cavity.*

We have recently succeeded in the construction of a simple and original microwave photochemical reactor, in which a number of photochemical systems have been studied [5-8]. It consists of an electrodeless discharge lamp (EDL) placed into the reaction vessel in a modified domestic microwave oven (**Figure 1**). The microwave field generates ultraviolet radiation by the lamp at the same time as it interacts with the reaction mixture. Evaluation of the MW superheating effects in polar solvents using a temperature dependent photochemical reaction [9] or changing the reaction selectivity in a radical-pair dynamics reactions [10] are typical examples of the microwave photochemistry applications.

The understanding, at the molecular scale, of the relevant processes implied in the microwave photochemistry has not reached the degree of maturity of other topics in chemistry yet. Such a challenge is somewhat ambitious due to several difficulties. Although some obstacles have been overcome, the study of a microwave effect on a photochemical reaction requires a special approach. The first results from kinetic studies, the most important applications (in the field of organic synthesis, environmental chemistry, or analysis), and technical details of a MW reactor will be discussed.

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