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To whom it is concerned

Report on the habilitation thesis: Chemical engineering contribution to artificial life research presented by Ing. Jitka Čejkova, Ph.D.

The habilitation thesis of Ing. Jitka Čejkova Ph.D is concerned with different nonequilibrium phenomena, that can appear in systems driven by the initial nonequilibrium state as the result of surface interactions.

The thesis includes 60 pages long overview on the subject presenting the author ideas and 7 thematically related publications co-authored by Ing. Jitka Čejkova Ph.D. In 6 of these publications Ing. Jitka Čejková Ph.D. is the first author, In the remaining one she is the last in the author list, but still she is the corresponding author of the paper. Therefore, I can conclude that Ing. Jitka Čejková Ph.D played the dominant role in the research included into her thesis.

The results presented by Ing. Jitka Čejková Ph.D are purely experimental. They cover observations of chemical systems driven by interfacial interactions that lead to the time evolution reminiscent of the behavior of so-called "living organisms". In such systems one can easily distinguish the biomimetic object and its surrounding. The author discusses such phenomena as chemo-taxis, chemistry induced morphological transformations and collective behaviour. The enclosed publications prove that Ing. Jitka Čejková Ph.D has contributed to research on all these subjects. In my opinion the part of thesis describing the collective evolution of systems composed of many droplets brings the most inspiring results for the further studies.

Among the included publications I find the studies: Čejková J., Novák M., Štepánek F., Hanczyc M., Dynamics of chemotactic droplets in salt concentration gradients, Langmuir, 2014. 30(40): 11937–11944. and . Čejková J., Šepánek F., Hanczyc M., Evaporation-induced pattern formation of decanol droplets, Langmuir, 2016. 32 (19): p. 4800-4805 the most interesting. The first one presents a detailed experimental material on the droplet motion under the gradient of NaCl and suggests an interesting strategy for the feedback between a droplet system and its environment. The second is concerned with morphological changes recorded during the time evolution of decanol droplets in a specially prepared environment. Qualitatively similar behaviour has been recently observed by R. Loffler et. al. in paraffin droplets containing camphor as the surface active agent.

In the overview Ing. Jitka Čejková Ph.D presented an interesting analogy between the fiction created by a Czech writer Capek almost 100 years ago and the modem attempts to generate non-biological forms of live-like systems. However, the described experimental results illustrate that, if compared to Capek fiction, the use of the word "robot" to describe

droplet behaviour (liquid robots in Section 2) looks premature, because the discussed systems show very little functionality (besides the ability to move or to change shape in response to a chemical stimulus). I would be interested to learn the opinion of Ing. Jitka Čejková Ph.D on engineering the interface between the future soft robots and their environment. Which physical phenomena or chemical reactions are expected to be useful to input information into a soft robot?

There are many arguments in the habilitation thesis that the field of unconventional robotics (i.e. robotics with information processing units that are not semiconductor microprocessors) can benefit from studies on artificial life. I would like to learn the candidate opinion on the reverse influence. Can conventional modern robotics and artificial intelligence algorithms executed on standard computers support research on artificial life? Can the candidate identify the areas of research on artificial life, where implementation of robot chemists controlled by artificial intelligence seems the most promising?

I think the publishing record of Ing. Jitka Čejkova Ph.D. corresponds to what is expected from a habilitation candidate. According to Web of Science database she coauthored 20 papers (4 related to her doctor dessertation, the other concernwo with the subject of habilitation). The papers of of Ing. Jitka Čejková Ph.D. were cited almost 200 times (without autocitations) and her h-index is 7. Two of her papers (Čejková J., Novák M., Štepánek F., Hanczyc M., Dynamics of chemotactic droplets in salt concentration gradients, Langmuir, 2014. 30(40): 11937–11944, which is included into the habilitation thesis and Investigation of internal microstructure and thermo-responsive properties of composite PNIPAM/silica microcapsules, Cejkova, Jitka; Hanus, Jaroslav; Stepanek, Frantisek, Journal of colloid and interference science, vol. 346 , pp 352-360, 2010) already have over 40 citations.

Concluding my report I believe that the habilitation thesis of Ing. Jitka Čejkova Ph.D. satisfies the requirements of the Act no.111/1998 and the candidate should be granted the title of docent.

Jerzy Gerecki