ENCAPSULATION OF THE ANESTHETIC SEVOFLURANE BY TERT-BUTYLCALIX[4]ARENE DERIVATIVE

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The development of receptors capable of encapsulating volatile anesthetics to form inclusion compounds (solvates) is a pressing challenge for capturing waste inhalation gases and for use in local (topical) anesthesia. A widely used inhalation anesthetic is sevoflurane. For local non-injection anesthesia, a solvate (inclusion compound) with sevoflurane, which is stable at room temperature and releases the anesthetic at body temperature, may be convenient.

In this work, the process of encapsulation of sevoflurane from the gas phase by a solid derivative of tert-butylcalix[4]arene, which does not possess significant cytotoxicity, was studied. Using previously described methods for preparing polymorphs of calixarenes and inclusion compounds [1,2], the ability of different polymorphic forms and the amorphous form of the receptor to include effectively sevoflurane from the vapor phase, also in the presence of saturated water vapor, was studied, as well as the ability of inclusion compounds prepared in different ways to desorb the included guest at different temperatures. The temperature dependence of the sevoflurane release from the inclusion compound and the kinetic parameters of this process upon heating were determined. The prepared inclusion compound of sevoflurane with calixarene was shown to release upon slight heating an optimal concentration of sevoflurane for local anesthesia.

1. M.N.Gabdulkhaev, M.A.Ziganshin, A.V.Buzyurov, C.Schick, S.E. Solovieva, E.V. Popova, A.T. Gubaidullin, V.V. Gorbatchuk // CrystEngComm, 2020, 22, 7002-7015. https://doi.org/10.1039/d0ce01070g

2. M.N. Gabdulkhaev, M.A. Ziganshin, A.T. Gubaidullin, V.V. Gorbachuk // Journal of Structural Chemistry, 2023, 64, 2040-2050. https://doi.org/10.1134/S0022476623110021

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