

# CHEMICAL REDUCTIVE DEBROMINATION OF FLAME RETARDANTS BY NANO ZERO VALENT IRON

CHEMICKÁ REDUKTIVNÍ DEBROMACE RETARDÁTORŮ HOŘENÍ NANOŽELEZEM

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## **Abstract:**

Flame retardants (FR) are products distinctly reducing the hazards of fire. Polybrominated diphenyl ethers (PBDE) constitute one of the most important FR. FR appear primarily in plastics. This is so mainly thanks to their thermal stability and the low price that play an important role in the choice of a suitable FR. Unfortunately, PBDE are toxic, cumulative and easily loosen from the material while contaminating the environment (Carvalho-Knighton et al., 2009; Birnbaum and Stokes, 2010). With the purpose of diminishing the burden for the environment and minimization of the spread of these substances various means of their degradation are being investigated. Unfortunately, there is no appropriate method for their efficient disposal. Biological degradation of PBDE's is basically useless due to the extremely slow reaction. Possible way of destruction of PBDE molecules by oxidation using UV radiation can lead to the formation of highly toxic polybrominated dibenzodioxins and furans.

One of suitable methods to reduce the health risks of PBDE's is a reductive debromination. Options of the chemical reduction are very widespread in water treatment technologies from a variety of organic pollutants, especially at various chlorinated compounds (Wang and Zhang, 1997; Li et al., 2007). Very effective is the use of iron (Shih and Tai, 2010) with particle size in nanometers (NZVI). The work presents the results of the reductive debromination of PBDE by nano zero valent iron. In conformity with the literature, batch experiments confirmed the greater efficiency of degradation of PBDE in the acidic pH 4. The synthetic nanostructured iron was removed by 79% decaBDE (BDE 209) during 4 hours with the dominant component of pentaBDE in the resulting reaction mixture.

## **Keywords:**

Chemical reductive, flame retardant, polybrominated diphenyl ethers, debromination, nano zero valent iron, dehalogenation