

# 1 Models of Turbulent Transport and Transfer of Disperse Phase 2 Mass in Liquids

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## 7 Abstract

8 Using the theory of turbulent migration of particles and boundary layer models, expressions  
9 for calculation of particle transport coefficients and of mass transfer within the continuous  
10 phase are obtained. Various cases of turbulent direct flow of particles through the carrier  
11 turbulent medium are considered: smooth and rough channel; channel filled with fine random  
12 packing and apparatuses with mechanical mixing. Examples of calculation of mass transfer  
13 from droplets and solid particles are included and their agreement with experimental data of  
14 other authors is demonstrated.

15

16 **Index terms**— turbulence, direct flow, momentum transfer, mass transfer, mixing, extraction, dissolution.  
17 ?????????????? ??????. ??? ?????? ??? ?????????????? ?????? ??? ?????? ?????????????? ?????????? ???  
18 ?????? ? ?????????????? ??????????. ?????????? ?????????? ? ?????????? ??????????. ?????????? ?????? ?  
19 ?????????????? ??????????. ?????????? ?????????? ? ?????????? ??????????. ?????????????? ?????????????? ??????  
20 ?????????? ?????????? ?????? ??? ?????????? ?????????????????? ?????????? ?????????? ?????? ? ?????? ??????????  
21 ??? ?????????????? ?????? ??? ?????????? ?????????? ?????????? ?????? ? ?????????? ?????? ?????????? ??????????  
22 ?????????????? [14].  
23 ??D????????? ?????? d ? ??? ? ? ?????????? ? ?????????? ?????? ?? ?????????????? ?????? ? ?????????? ?????:  
24 d ? « â??».  
25 ??? ?????? ?????????????? ?????? ?????????? ?????????? ??????????, ?????????? ? ?????????? ?????????? ??????  
26 ?????????? ?????? ?????????????? ?????? ?????? ?????????????? ?. ?????????????????? (d ? <1 ???);  
27 ?????????????? (1< d ? <20 ???) ? ?????????????? (20< d ? <200 ???).  
28 ?. ?????? ?????? ?????? ?????? ? ?????????? ?, ? ?????? ?????? ?????? ?????? ?? ?????? ?????? ??????  
29 ?????????? ?????? ?????? ?????????????? ?????? ?????????????? ?????????????? ??????????????

## 30 1 . ?????? ?????? ??????

31 ? = + y v v (6) , 6 . 11 , ð ? ? R y y v v ? < = + + (7)  
32 ?????? ?????????????? (3) ?????? ?????? ( ), / ln 1 1 1 \* R R R u ? ? ? + = (8) ??? R 1 = \* u ? 1 / ?  
33 -????????????? ?????? ?????? , ? ?????? ?????? R 1 = 11.6; ? = 0.4 - ?????????? ?????????????? .  
34 ?????? ?????? ?????? (5) ? (8). D????? ?????? ?? ?????? ?????????????????? ?????????? ?????? ??????  
35 ?????? ?????????????? ?????? ? ?????? ? ?????????? [7,10] (9) ??? ? ? ??????-????????? n = 0,66. ??????,  
36 ??? ???????, ??? ?????? ? ?????? ?????????????? ?????????? n = 0,6-0,57.  
37 ?? ?????? (5), (8) ? \* u ?????????? ?????? ? ?????? ? ???????, ñ / i [13].  
38 D????? ?????? ?????? C f? = ?/4, ??? ?????????? ?????? ? ?????? ?????????? ?????? ??????  
39 ?=0.316/Re ? 0.25 ; Re ? =U ? d ? /? (?? ?????????????? ?????? d=d ? ); ý d -????????????? ??????  
40 ??????, ?; ? = ñâ v ñâ ; / 4 ? ? à d ý ?????? ?????? ??????, 3 3 i / i ; v à -????????? ?????? ??????= =  
41 ? ? / ? . ?????? ?=0.25d ? ? ?????? R ? . 25 . 0 \* v u d R ý =?(14)  
42 ?????????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ??????  
43 ??? ? ? ?????????? ???, ??? ?????? ??? ?????? ??? ?????? ?????? (??????, ??? ??????????).  
44 ????????

## 2 III. ?????????????? ?????????? ????????

97 3 V. ?????????????? ??? ???? ??????????????????

98 Đ?????? ?????????? ?????????? ??? ?????????????????? ?????????? ??? ?????? ?????????? ??? ?????? ? ????????
 99 ?????? ? ???????? ? ???????? ??? ?????????? ?????? .
 100 ?????????? ?????? ?????????? ?????????? ?????????? ?????? ?????? ? ?????????????? ?????? ?????? ???????
 101 ?????? ??????, ?????? ??? ?? ?????? ?????? ?????????????? ?????? . ? ?????? [15] ?????????? ???????
 102 ?????? ?????? ?????? ?????? ?????????????? ??? ?????????????? ?????? (?????????) (32)):2 iáº 2 2 0 u u u k
 103 + + = ? ,**(35)**
 104 ??? u ?????????? ?????????????? :i ê ì d d u u ae ê iáº 6 ? ? ? ? = ,**(36)**??? u ? -????????? ???????
 105 ?????? ?????? ??????, /?: u ? = ? n d ? , n -????????? ?????? ?, ? -1 ; d ? -????????? ?????? ?, ? -??????????
 106 ?????????? ??? ?????? ??????, ? k = f(Re ? ).

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107 ??????? ?????????????? ??????? ?? ?????????? ?????????????? ?????? ?????? ?? ?????????? [6,7] ?????? ??????  
108 ??????? ?????????????? ? ?????????? ??? ?????????????? ??????? ??????.  
109 ?? ??????? 2 ??????? ?????????? ?????????? ? ?????????????????? ?????? [15] ?? ??????????  
110 ?????????????? ?????? ? ??????? ?????? ?????? ??????. D?"????? ?????? ?????? ?????????????? ?????? -30, 8?10 -6  
; 593?10 -6 , ?. <sup>1</sup>



Figure 1: 3 ?

111

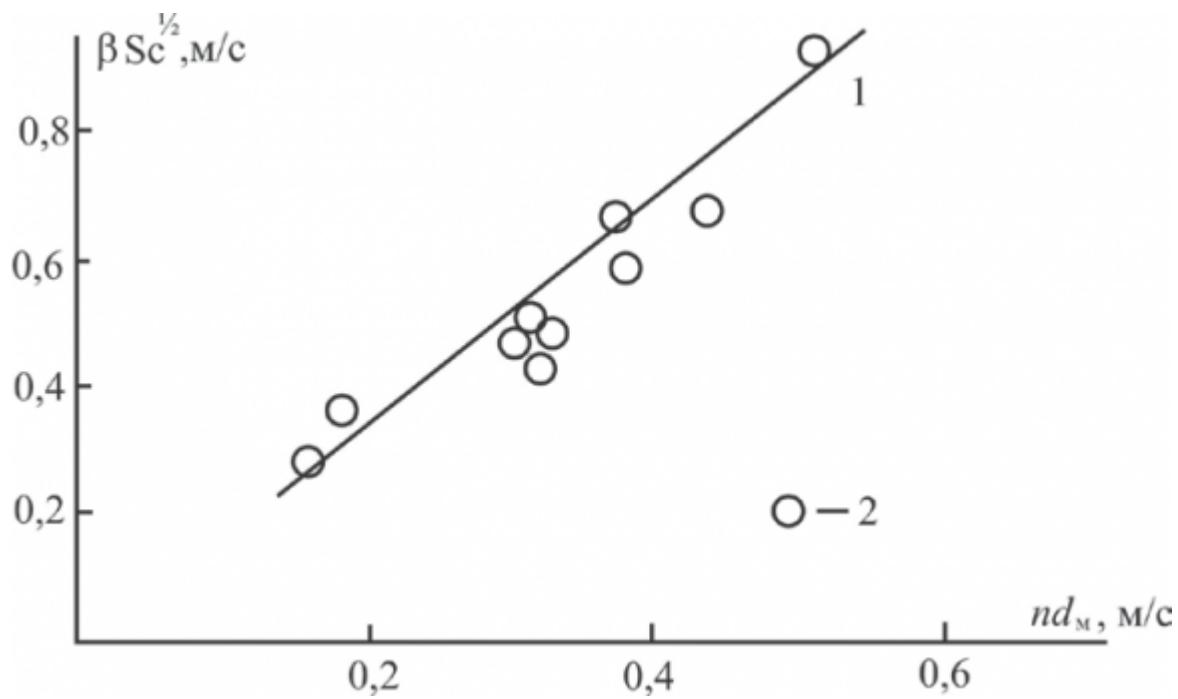


Figure 2:

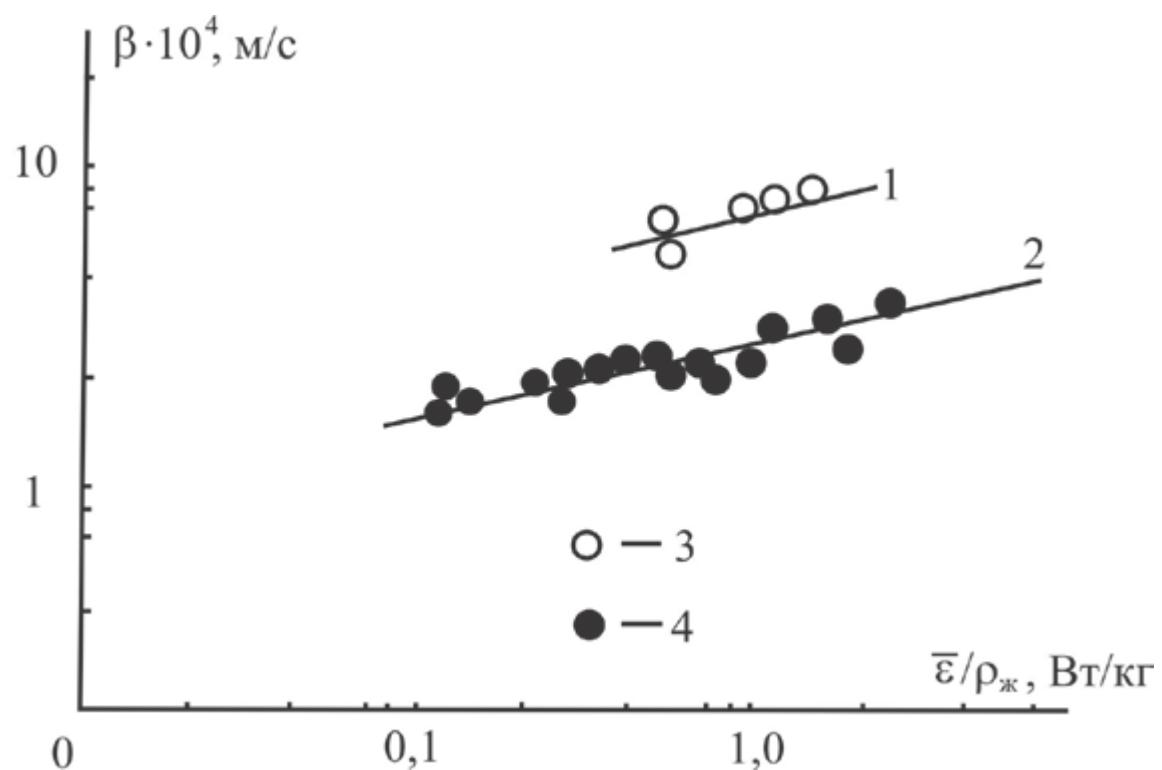


Figure 3:

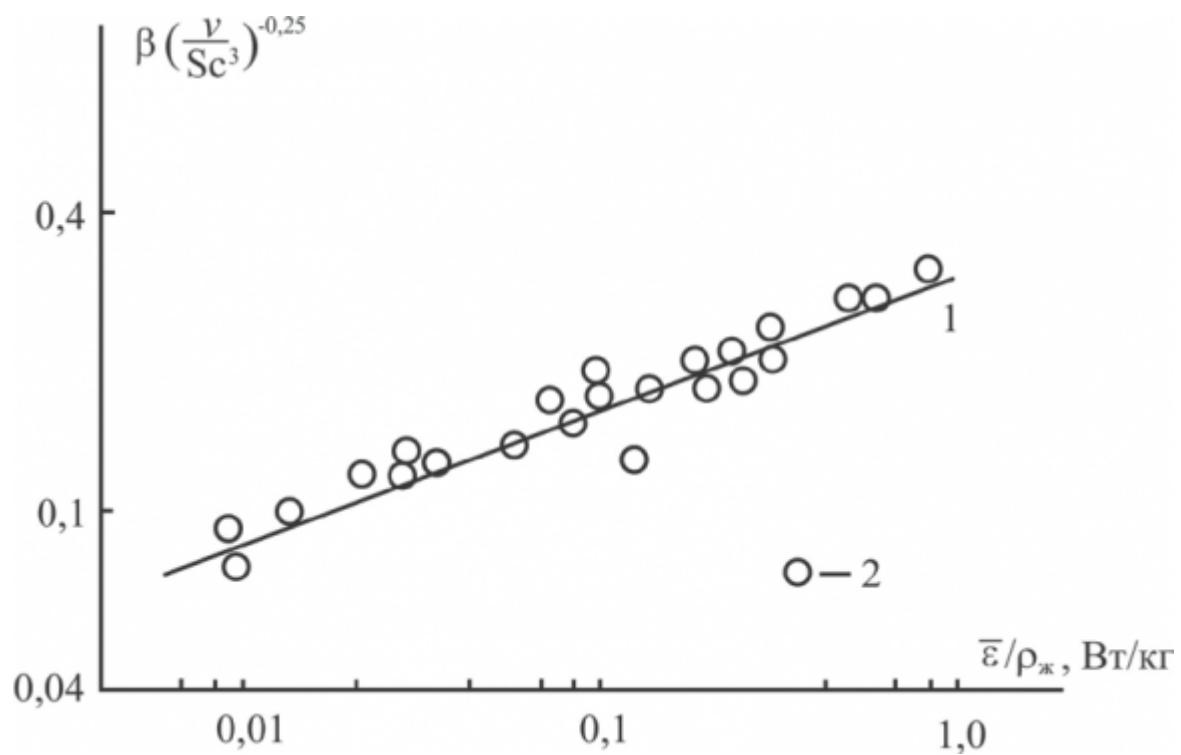


Figure 4:

### **3 V. ??????????? ??? ??????????????**

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????????????? ? ? ? ? > 100 ??????? ?????????? ?????????????? ? ??? (μ 2 p ? 0). ?? ???????? ? (15) ? (16)  
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d ÷

? E ? p = ? 9 ae ? μ ? d ÷ 2 f  
> 30 ? ae ? ? μ f = 13

?? ??????? (16) ? (18) ??????, ??? ??????,

????????? ? ?????????????? ??????, ??? ?????? ?????? ?? ?????????????? ??????, ??? ?????? ?? ?????????? ? ??????

[Note: ?); © 2014 Global Journals Inc. (US)]

Figure 5:

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2011. -? .336.

11. ?????? ?.?, ?????? ?.?. ??????????????

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Figure 6:

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