The Influence of Flushing Time on The Bonding Quality of Liquid White Cast Iron on The Solid Surface of Similar Material

by Rendi Reynaldi

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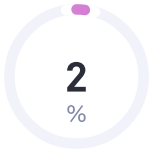

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Writing Issues

44	**Clarity**	
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17	Punctuation in compound/complex sentences	
44	Misspelled words	
7	Incorrect noun number	
2	Incorrect verb forms	
9	Confused words	
6	Mixed dialects of english	
9	Comma misuse within clauses	
10	Faulty subject-verb agreement	
1	Misplaced words or phrases	
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11	Improper formatting	
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Measures average sentence length

11

words per sentence

The Influence of Flushing Time on The Bonding Quality of Liquid White Cast Iron on The Solid Surface of Similar Material

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The Influence of Flushing Time on The Bonding Quality of Liquid White Cast Iron on The Solid Surface of Similar
Material

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Abstract. Hard metal castings are widely used[1] in the coal mill pulverizer as construction[2] material for coal crushers. During its operation crushers[3] and mills experience degradation caused by abrasion load. This research dealed[4] with the surface overlaying of similiar[5] material[6] on the surface of white cast iron by mean

of gravity casting. The die blank casting was preheated prior to the casting process of outer layer made of Ni-Hard white cast iron to guarantee bonding processes and avoid any crack. The preheating temperature of die blankin ther range of 500C up to 850C was set up to reach the interface temperature in the range of 887°C -1198°C and the flushing time was varied between 10-20 seconds. Studies carried on the microstructure of sample material revealed a formation of metallurgical bonding at the preheating temperature above 625 ˚C by pouring temperature ranging from 1438 ˚C to 1468 ˚C. Metallographical and chemical composition by mean of EDS examination were performed to observed the resut. This research concludes that the casting of Ni-Hard 1 overlay by applying gravity casting method can be done by preheating the surface of casting to 625 ˚C, interface temperature of 1150 ˚C, flushing time of 7 seconds and pouring temperature of 1430 ˚C. Excellent metallurgical bonding at the contact area between dieblank and overlay material has been achieved in which there is no parting line at the interface area to be observed.

INTRODUCTION

Hard material such as chromium white cast iron is used as grinding element in mining industries. Abrasion process on the surface of grinding elements caused wear and need to be repaired. Surface overlaying as one of alternative solution for repairing grinding elements can be considered as manufacturing process of bimetal by using similiar material. In general, the technologyof bimetal casting consisting of working surface layer and a base part is achieved based on two systems, i.e.liquid-liquid [1,2] and liquid-solid [3,4].
The basis concept of technology applied in this research is mould cavity preparation [5,6]. Die blank was inserted in the mould and Liquid melts was

subsquently poured into the mold without any preheating and preheating at various temperature. The bonding between two materials will be achieved through the formation of metallurgical bonding at the interface in kind of difussion bonding and partial melting [7].

The proper temperature of preheating, the contact interface temperature and the flushing time were the concern of this work. The interface temperature should range between 50% up to 70% of the lowest liquid temperature of both material, due to facilitate the diffusion process [8]. The preheating temperature of dieblank should avoid the initiation of crack.

The susceptibility of steel to cold cracking [9] can be expressed as equation (1 and 2) below:

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$$CE = C + A(C)\ Si + Mn + Cu + Ni + Cr+Mo+Nb+V + 5B \quad (1)$$
$$24\ 6\ 15\ 20\ 5$$

Whereas $A(C) = 0.75 + 0.25 \tanh\{20(C - 0.12)\}$ (2)

As a parameter for describing the probability of the occurrence of cold cracking, a cracking index (CI) was proposed. CI is expressed as equation (3):

CI = CE + 0.15 log Hhc + 0.3 log(0.017ktaw) (3)

The necessary preheating temperatures to avoid cold cracking are determined by satisfying the following criterion t100 (t100)cr where t100 is the cooling time to 100 °C (212 °F). Critical time (t100)cr is given as equation (4):

(t100)cr = exp(67.6CI3 — 182CI2 + 163.8 GI — 41) (4)

234 The aim of this paper is to describe a technology of surface overlaying by applying castings method for a white cast iron – ductile cast iron bimetallic grinding roll which applied for coal mill crusher. In the presented technology, preheating die blank was done by passing liquid melts in direct contact. This technology can be a significant contribution for commonly used technologies of surface overlaying,becauseit does not initiate cracks in the interface area (joint area) and heat affected zone.

The microstructure of Ni-Hard 1 consists of eutectic carbide M3C and austenite-martensite matrix. This can be achieved with a chemical composition of Ni-Hard 1 containing 4% Ni and 2% Cr.

(a) (b)

FIGURE 1.(a) Microstructure of Ni-Hard 1 Contained Primary Dendrite, Eutectic Carbide and (b) Microstructure of M3C

MATERIALS AND METHODS

235 The aim of this study is to make surface overlaying on the top of solid surface of solid Ni-Hard material. The overlaying technique is using liquid Ni-Hard which is pouring to flow or flush the on to the surface of solid Ni-Hard. To be bond, it need a time for increasing the temperature of solid surface then the diffusion

mechanism can take a part of bonding at suitable temperature. Further, this study also aimed to find the appropriate flushing time in order to make the best bonding between liquid material into solid surface.

To give an approach of the required flushing time, simulation was conducted by using solid cast software. Casting simulation with software solidcast 8.2 was applied to calculate the interface temperature, which will will be increased due the the pouring of liquid melts and the following. The data was used to determine reference value of pouring temperature and flushing time. Figure 2 describe the interdependence of interface temperature on the flushing time by pouring temperature of 1490 ˚C.

FIGURE 2.The Simulation Flushing Time on Result of Interface Temperature

Without any flushing time the minimum target of 50% of Liquidus Temperature at the interface as pre requisite for diffusion bonding was not achieved. The interface temperature was 542 ˚C and it was considerably below the minimum temperature of 612.5 ˚C. Flushing time of 5 seconds resulted an increase of temperature upto 829.2 ˚C (67.7% of TL) and therefore 5 seconds was setup as the baseline. Flushing time of 25 seconds resulted an increase of temperature upto 1275 ˚C (TL = 1225 ˚C) and therefore 25 seconds was setup as the maximum value.

Table 1 and 2 describe the chemical composition of material. The die blank and overlay composed from the same material that were Ni-Hard 1 white cast iron.

TABLE1. Chemical Composition of The Ni-Hard 1 (White Cast Iron)

Elements Content (%wt.)

C Si Mn P S Ni Cr

3.36 0.38 0.27 0.007 0.009 3.9 2.07

The processes then follow by implementation with an experiment of surface overlaying of Ni-Hard Material. The processes[114] is using parameter[115] of flushing time that is given by the simulation. Figure 3 show[116] the design of surface overlaying processes. Die blank was cleaned by mean[117] of shot blasting and inserted into the mould.[118] Liquid melts was[119] poured into the mold[120] at pre determined[121] pouring[122,123] temperature, reservoir basin or[124] overflow tank was built as a cavity in the mould[125,126] to produce the exact flushing time. During the process[127] two thermocouples were placed at the bottom of the casting to measure the temperature of liquid[128] and at the top of cavity[129] to measure the temperature of the die blank.

(b)

FIGURE 3.(a) Casting Design and (b) Technical Drawing

To facilitate the formation of metallurgical bonding at the interface, following parameters and value were set up: flushing time 5 to 25 seconds with an interval of 5s and pouring temperature of 1430 ˚C– 1470 ˚C[130] , aspects were done[13]: the performance the quality of the joint were evaluated[132] focused on the interface area. The macroscopic examinations were carried[133] out by using stereo microscopy, which is then followed by microscopic examinations.[134] Sampels[135] were taken from the casting at the cross section[136] area to provide the surface of both material and its interface area.

RESULTS AND DISCUSSION

The observation has conducted by measuring pouring time, pouring temperature and chemical composition of Nihard1 white cast iron, as shown at Table 2.

1

2

3

4

5

Pouring time (s)

7

17

17

24

25

Pouring Temperature (°C)

1468

1439

1438

1448

1459

Flushing time (s)	C	Si	Mn	P	S	Ni	Cr
5	3.36	0.38	0.27	0.007	0.009	3.9	2.07
10							
15							
20							
25							

TABLE 2.Pouring Time, Pouring Temperature and Chemical Composition

Chemical Composition (%)

FIGURE 4.Sample Preparation for Visual and Microscopic Observation

Figure 4 show[139] the sample preparation for visual and microscopic observation. Sample[140] was cut at cross[141] sectional[142] area on interface[143] to observe the microstructure and the quality of bonding by optical microscope and SEM.

FIGURE 5.Temperature Change on Flushing Time of 5 Seconds

Figure 5 show[144] the experiment of 5 s flushing time. The temperature of liquid melts as it entered into the mold was 1383.1oC(it contributed a temperature difference between pouring temperature and temperature at cavity of84.9℃). It required subsequently 4 seconds to obtain equal[145] temperature of those dieblank[146] and overlay material at temperature[147] of 1003.8oC. Due to the absorption of heat by the sand, the temperature dropped rapidly. The temperature increased up to 937oC (76.57 % of TL) in 143 seconds. Total available difusion[148] time (>700oC) was 370s.

FIGURE 6. Temperature Change on Flushing Time of 25 Seconds

Figure 6 show the experiment of 25 s flushing time. The temperature of liquid melts in the mold was 1425.6oC (temperature difference between pouring temperature and temperature at cavity was 33.4 ˚C). 4 seconds after pouring the temperature of dieblank was equal to the temperature of overlay material (1108.6 ˚C). The flushing time of 24s caused a remarkable increase of temperature at dieblank upto 1435.2 ˚C after 17s. The interface temperature after 34 s was 1344 ˚C (>TL) which indicates that the interface was melted. Total available difusion time (>700 ˚C) was 719s.

FIGURE 7.Comparation of Interface Temperature on Flushing Time (Simulation and Actual)

Figure 7 show the comparison of actual flushing time vs simulation. It can be seen that the gap difference between simulation and actual is about 107 to 68 ˚C. The difference then be corrected on the simulation, then the prediction will be more accurate.

The Formation of Microstructure at The Interface

By flushing time of 5s a line at the interface was clearly identified. By further SEM and EDS examination, the layer formed at the interface area could be identified as oxide layer. Die blank and overlay material did not form a metallurgical bonding, as seen on Figure 8.

FIGURE 8.(a) 5 Seconds Flushing Time, Interface Line Under SEM, (b) 2 Materials, {c,d) Interface Area Die Blank and Overlay Under Optical Microscope

Flushing time of 10s–20s resulted a good metallurgical bonding and caused the absence of interface oxide layer. There was no markable interface line can be observed. The orientation of microstructure of both die blank material and overlay material indicated good bonding. The growth of eutectic colony in kind of edgewise growth and cooperative growth was unified. The interface was not to be observed , since the microstructure was uniform, as seen on Figure 9.

FIGURE 9.(a)10-20 Seconds Flushing Time 2 Materials at 10 s, (b) Interface Area at 10 s, (c) 2 Materials at 20 s, (d) Interface Area at 20 s

By longer flushing time (25 s) the interface temperature exceeded the liquidus temperature significantly and caused partial melting of dieblank. As shown at Figure 10 (b) it was partial melting of dieblank and drifting to overflow tank.

FIGURE 10.(a) 10-20 Seconds Flushing Time 2 Materials at 25 s, (b) Partial Melting at 25 s, (c,d) Interface Area at 25 s

Hardness

Hardness measurement was conducted to all speciments. Table 3 shows the hardness of dieblank as well as the overlay material. Since the overlay material had similar microstructure to the dieblank, the hardness of those material did not show significant difference. The similar fraction of carbide and the similar

microstructure of matrix has contributed to the simillar hardness. As shown on Table 3 the hardness ranges between 56 HRC to 60.4 HRC.

TABLE 3.Hardness of Dieblankand Overlay Material

Rockwell C Hardness testing (load 150 Kg)

flushing 1

2

3

average

1

2

3

average

5 54.2

57.3

57.5

56.33

55

56.6

60.5

57.37

10 59.6

57.9

57.9

58.47

56.1

56.7

57.3

56.70

15 55.8

56.3

56

56.03

57.4

56.4

56.3

56.70

20 56

56.4

55.6

56.00

57.4

56.6

55.5

56.50

25 57.4

58.7

60.5

58.87

60.7

60.7

59.8

60.40

Sample Die blank area, HRC Overlay area, HRC

time(seconds)

CONCLUSION

Based on the obtained results it can be concluded that influental parameters for creation of a metallurgical bonding at the interface of bimetallic casting without the presence of crack are interface temperature and the flushing time. The decissive influence of preheating temperature on the preventing of crack results from its ability to decrease the cooling rate of overlay material after solidification and the subsequent cooling. At higher temperature of interface near to the solidus temperature (1003.8°C) and 10 seconds of flushing time, muzzy condition of interface and fusion process may take place. Metallurgical bonding occured most favourably at preheating temperature of 625 °C, maximum interface temperature of dieblank of 1080 °C and cooling rate of 44 °C.min-1.

ACKNOWLEDGMENT

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1.	*are widely used*	Passive Voice Misuse	Clarity
2.	a construction, or the construction	Determiner Use (a/an/the/this, etc.)	Correctness
3.	, crushers	Punctuation in Compound/Complex Sentences	Correctness
4.	~~dealed~~ → dealt	Misspelled Words	Correctness
5.	~~similiar~~ → similar	Misspelled Words	Correctness
6.	~~material~~ → content	Word Choice	Engagement
7.	~~mean~~ → means	Incorrect Noun Number	Correctness
8.	~~prior to~~ → before	Wordy Sentences	Clarity
9.	the outer	Determiner Use (a/an/the/this, etc.)	Correctness
10.		Intricate Text	Clarity
11.	~~blankin~~ → blanking, blank in, blanks	Misspelled Words	Correctness
12.	~~ther~~ → the	Misspelled Words	Correctness
13.	*was set*	Passive Voice Misuse	Clarity
14.	~~range~~ → field	Word Choice	Engagement
15.	, and	Punctuation in Compound/Complex Sentences	Correctness
16.	*was varied*	Passive Voice Misuse	Clarity
17.	*Studies carried on the microstructure of sample material revealed a formation of metallurgical bonding at the preheating temperature above 625 ℃ by pouring temperature ranging from 1438 ℃ to 1468 ℃.*	Hard-to-read text	Clarity

18.	~~Metallographical~~ → Metallographic	Misspelled Words	Correctness
19.	~~mean~~ → means	Incorrect Noun Number	Correctness
20.	*were performed*	Passive Voice Misuse	Clarity
21.	~~observed~~ → observe	Incorrect Verb Forms	Correctness
22.	~~resut~~ → result	Misspelled Words	Correctness
23.	the gravity	Determiner Use (a/an/the/this, etc.)	Correctness
24.	*be done*	Passive Voice Misuse	Clarity
25.	~~dieblank~~ → die blank	Misspelled Words	Correctness
26.	*been achieved*	Passive Voice Misuse	Clarity
27.	~~to be observed~~	Wordy Sentences	Clarity
28.	A hard	Determiner Use (a/an/the/this, etc.)	Correctness
29.	*is used*	Passive Voice Misuse	Clarity
30.	a grinding	Determiner Use (a/an/the/this, etc.)	Correctness
31.	~~elements~~ → parts	Word Choice	Engagement
32.	*be repaired*	Passive Voice Misuse	Clarity
33.	~~one of~~ → an	Wordy Sentences	Clarity
34.	an alternative	Determiner Use (a/an/the/this, etc.)	Correctness
35.	~~repairing~~ → improving	Word Choice	Engagement

36.	~~elements~~ → components, items	Word Choice	Engagement
37.	*be considered*	Passive Voice Misuse	Clarity
38.	the manufacturing	Determiner Use (a/an/the/this, etc.)	Correctness
39.	~~similiar~~ → similar	Misspelled Words	Correctness
40.	~~technologyof~~ → technology of, technology	Misspelled Words	Correctness
41.	the working	Determiner Use (a/an/the/this, etc.)	Correctness
42.	~~i~~ → I	Misspelled Words	Correctness
43.	~~basis~~ → basic	Confused Words	Correctness
44.	~~mould~~ → mold	Mixed Dialects of English	Correctness
45.	*was inserted*	Passive Voice Misuse	Clarity
46.	~~mould~~ → mold	Mixed Dialects of English	Correctness
47.	~~subsquently~~ → subsequently	Misspelled Words	Correctness
48.	~~mold~~ → frame, image	Word Choice	Engagement
49.	by forming	Wordy Sentences	Clarity
50.	~~difussion~~ → diffusion	Misspelled Words	Correctness
51.	, and	Comma Misuse within Clauses	Correctness
52.	~~material~~ → materials	Incorrect Noun Number	Correctness
53.		Intricate Text	Clarity
54.	~~dieblank~~ → die blank	Misspelled Words	Correctness
55.	*be expressed*	Passive Voice Misuse	Clarity

56.	*was proposed*	Passive Voice Misuse	Clarity
57.	*is expressed*	Passive Voice Misuse	Clarity
58.	This paper aims	Wordy Sentences	Clarity
59.	~~a~~ white	Determiner Use (a/an/the/this, etc.)	Correctness
60.	, which	Punctuation in Compound/Complex Sentences	Correctness
61.	~~applied~~ → used	Word Choice	Engagement
62.		Intricate Text	Clarity
63.	*was done*	Passive Voice Misuse	Clarity
64.	~~technologies~~ → techniques	Word Choice	Engagement
65.	~~becauseit~~ → because it	Misspelled Words	Correctness
66.	~~joint~~ → common	Word Choice	Engagement
67.	~~heat affected~~ → heat-affected	Misspelled Words	Correctness
68.		Intricate Text	Clarity
69.	*This*	Intricate Text	Clarity
70.	*be achieved*	Passive Voice Misuse	Clarity
71.	This study aims	Wordy Sentences	Clarity
72.	the solid	Determiner Use (a/an/the/this, etc.)	Correctness
73.	~~need~~ → needs	Faulty Subject-Verb Agreement	Correctness
74.	the solid	Determiner Use (a/an/the/this, etc.)	Correctness

75.	a suitable	Determiner Use (a/an/the/this, etc.)	Correctness
76.	~~in order to~~ → to	Wordy Sentences	Clarity
77.	a solid	Determiner Use (a/an/the/this, etc.)	Correctness
78.	*To give an approach of the required flushing time*	Misplaced Words or Phrases	Correctness
79.	the simulation, or a simulation	Determiner Use (a/an/the/this, etc.)	Correctness
80.	*was conducted*	Passive Voice Misuse	Clarity
81.	~~solid~~ → stable, robust, reliable	Word Choice	Engagement
82.	~~solidcast~~ → solid cast, solid-cast	Misspelled Words	Correctness
83.	will ~~will~~	Misspelled Words	Correctness
84.	*be increased*	Passive Voice Misuse	Clarity
85.	due to	Wrong or Missing Prepositions	Correctness
86.	the ~~the~~ pouring	Misspelled Words	Correctness
87.		Intricate Text	Clarity
88.	*was used*	Passive Voice Misuse	Clarity
89.	the reference	Determiner Use (a/an/the/this, etc.)	Correctness
90.	~~describe~~ → describes	Faulty Subject-Verb Agreement	Correctness
91.	a temperature	Determiner Use (a/an/the/this, etc.)	Correctness

92.	time,	Comma Misuse within Clauses	Correctness
93.	~~pre requisite~~ → prerequisite	Confused Words	Correctness
94.	, and	Punctuation in Compound/Complex Sentences	Correctness
95.	~~an~~ → in	Confused Words	Correctness
96.	in an	Wrong or Missing Prepositions	Correctness
97.	~~upto~~ → up to	Misspelled Words	Correctness
98.	, and	Punctuation in Compound/Complex Sentences	Correctness
99.	therefore,	Punctuation in Compound/Complex Sentences	Correctness
100.	~~setup~~ → set up	Confused Words	Correctness
101.	~~an~~ → in	Confused Words	Correctness
102.	in an	Wrong or Missing Prepositions	Correctness
103.	~~increase of~~ → increase of	Improper Formatting	Correctness
104.	~~upto~~ → up to	Misspelled Words	Correctness
105.	, and	Punctuation in Compound/Complex Sentences	Correctness
106.	therefore,	Punctuation in Compound/Complex Sentences	Correctness
107.	~~setup~~ → set up	Confused Words	Correctness
108.	~~Table~~ → Tables	Incorrect Noun Number	Correctness
109.	the material, or a material	Determiner Use (a/an/the/this, etc.)	Correctness

110.	~~. The~~ → —the	Incomplete Sentences	Correctness
111.	~~from~~ → of	Wrong or Missing Prepositions	Correctness
112.	~~material~~ → stuff	Word Choice	Engagement
113.	~~were~~ → was	Faulty Subject-Verb Agreement	Correctness
114.	~~processes~~ → process	Incorrect Noun Number	Correctness
115.	the parameter	Determiner Use (a/an/the/this, etc.)	Correctness
116.	~~show~~ → shows	Faulty Subject-Verb Agreement	Correctness
117.	~~mean~~ → means	Incorrect Noun Number	Correctness
118.	~~mould~~ → mold	Mixed Dialects of English	Correctness
119.	~~was~~ → were	Faulty Subject-Verb Agreement	Correctness
120.	~~mold~~ → frame	Word Choice	Engagement
121.	~~pre-determined~~ → predetermined	Confused Words	Correctness
122.	~~pouring~~ → draining	Word Choice	Engagement
123.	~~pouring~~ → to pour	Incorrect Verb Forms	Correctness
124.	, or	Comma Misuse within Clauses	Correctness
125.	~~mould~~ → image, frame, shape, pattern	Word Choice	Engagement
126.	~~mould~~ → mold	Mixed Dialects of English	Correctness
127.	process,	Comma Misuse within Clauses	Correctness
128.	the liquid	Determiner Use (a/an/the/this, etc.)	Correctness
129.	the cavity	Determiner Use (a/an/the/this,	Correctness

		etc.)	
130.	℃ ,	Improper Formatting	Correctness
131.	*were done*	Passive Voice Misuse	Clarity
132.	*were evaluated*	Passive Voice Misuse	Clarity
133.	*were carried*	Passive Voice Misuse	Clarity
134.	~~examinations~~ → studies	Word Choice	Engagement
135.	~~Sampels~~ → Samples	Misspelled Words	Correctness
136.	~~cross section~~ → cross-section	Misspelled Words	Correctness
137.	, and	Comma Misuse within Clauses	Correctness
138.	~~at~~ → in	Wrong or Missing Prepositions	Correctness
139.	~~show~~ → shows	Faulty Subject-Verb Agreement	Correctness
140.	The sample	Determiner Use (a/an/the/this, etc.)	Correctness
141.	the cross, or a cross	Determiner Use (a/an/the/this, etc.)	Correctness
142.	~~cross sectional~~ → cross-sectional	Misspelled Words	Correctness
143.	the interface, or an interface	Determiner Use (a/an/the/this, etc.)	Correctness
144.	~~show~~ → shows	Faulty Subject-Verb Agreement	Correctness
145.	the equal, or an equal	Determiner Use (a/an/the/this, etc.)	Correctness
146.	~~dieblank~~ → die blank	Misspelled Words	Correctness
147.	a temperature	Determiner Use (a/an/the/this, etc.)	Correctness

148.	~~difusion~~ → diffusion, defusion	Misspelled Words	Correctness
149.	~~show~~ → shows	Faulty Subject-Verb Agreement	Correctness
150.	, the	Punctuation in Compound/Complex Sentences	Correctness
151.	~~dieblank~~ → die blank	Misspelled Words	Correctness
152.	~~dieblank~~ → die blank	Misspelled Words	Correctness
153.	~~upto~~ → up to	Misspelled Words	Correctness
154.	, which	Punctuation in Compound/Complex Sentences	Correctness
155.	*was melted*	Passive Voice Misuse	Clarity
156.	~~difusion~~ → diffusion, defusion	Misspelled Words	Correctness
157.	~~Comparation~~ → Comparison	Misspelled Words	Correctness
158.	~~show~~ → shows	Faulty Subject-Verb Agreement	Correctness
159.	vs.	Comma Misuse within Clauses	Correctness
160.	*be seen*	Passive Voice Misuse	Clarity
161.	~~actual~~ → real	Word Choice	Engagement
162.	~~be~~ → is	Faulty Subject-Verb Agreement	Correctness
163.	the time	Determiner Use (a/an/the/this, etc.)	Correctness
164.	5s,	Comma Misuse within Clauses	Correctness
165.	~~clearly~~	Wordy Sentences	Clarity
166.	*be identified*	Passive Voice Misuse	Clarity

167.	~~identified~~ → defined, classified	Word Choice	Engagement
168.	an oxide	Determiner Use (a/an/the/this, etc.)	Correctness
169.	, and	Punctuation in Compound/Complex Sentences	Correctness
170.	~~form~~ → create, constitute	Word Choice	Engagement
171.	~~on~~ → in	Wrong or Missing Prepositions	Correctness
172.	in a	Wrong or Missing Prepositions	Correctness
173.	~~a good~~ → an excellent, a excellent	Word Choice	Engagement
174.	an interface	Determiner Use (a/an/the/this, etc.)	Correctness
175.	the microstructure	Determiner Use (a/an/the/this, etc.)	Correctness
176.	, and	Punctuation in Compound/Complex Sentences	Correctness
177.	the eutectic	Determiner Use (a/an/the/this, etc.)	Correctness
178.	*was unified*	Passive Voice Misuse	Clarity
179.	*be observed*	Passive Voice Misuse	Clarity
180.	observed,	Punctuation in Compound/Complex Sentences	Correctness
181.	~~on~~ → in	Wrong or Missing Prepositions	Correctness
182.	),	Punctuation in Compound/Complex Sentences	Correctness
183.	~~dieblank~~ → die blank	Misspelled Words	Correctness

184.	~~at~~ → in	Wrong or Missing Prepositions	Correctness
185.	, it	Punctuation in Compound/Complex Sentences	Correctness
186.	~~dieblank~~ → die blank	Misspelled Words	Correctness
187.	the overflow	Determiner Use (a/an/the/this, etc.)	Correctness
188.	*was conducted*	Passive Voice Misuse	Clarity
189.	~~to~~ → on	Wrong or Missing Prepositions	Correctness
190.	~~specimens~~ → specimens	Misspelled Words	Correctness
191.	~~dieblank~~ → die blank	Misspelled Words	Correctness
192.	~~dieblank~~ → die blank	Misspelled Words	Correctness
193.	~~material~~ → materials	Incorrect Noun Number	Correctness
194.	a significant	Determiner Use (a/an/the/this, etc.)	Correctness
195.	~~similar~~ → same	Word Choice	Engagement
196.	~~simillar~~ → similar	Misspelled Words	Correctness
197.	~~on~~ → in	Wrong or Missing Prepositions	Correctness
198.	3,	Punctuation in Compound/Complex Sentences	Correctness
199.	results,	Punctuation in Compound/Complex Sentences	Correctness
200.	~~influental~~ → influential	Misspelled Words	Correctness
201.	the creation	Determiner Use (a/an/the/this, etc.)	Correctness

202.	*Based on the obtained results it can be concluded that influental parameters for creation of a metallurgical bonding at the interface of bimetallic casting without the presence of crack are interface temperature and the flushing time.*	Hard-to-read text	Clarity
203.	~~decissive~~ → decisive	Misspelled Words	Correctness
204.	~~the~~ subsequent	Determiner Use (a/an/the/this, etc.)	Correctness
205.	*The decissive influence of preheating temperature on the preventing of crack results from its ability to decrease the cooling rate of overlay material after solidification and the subsequent cooling.*	Incomplete Sentences	Correctness
206.	a higher	Determiner Use (a/an/the/this, etc.)	Correctness
207.	the muzzy	Determiner Use (a/an/the/this, etc.)	Correctness
208.		Intricate Text	Clarity
209.	~~occured~~ → occurred, occurs	Misspelled Words	Correctness
210.	~~favourably~~ → favorably	Mixed Dialects of English	Correctness
211.	~~dieblank~~ → die blank	Misspelled Words	Correctness
212.	, and	Comma Misuse within Clauses	Correctness
213.	~~bi- metallic~~ → bimetallic	Confused Words	Correctness
214.	*S. Žic, I. Džambas, M. Konis, Possibilities of implementing bi-metallic hammer castings in crushing industries, Metalurgija 48, 51-54 (2009).*	Incomplete Sentences	Correctness

215.	, S	Improper Formatting	Correctness
216.	, W	Improper Formatting	Correctness
217.	, X	Improper Formatting	Correctness
218.	, Q	Improper Formatting	Correctness
219.	, HighCrwhitecastiron	Improper Formatting	Correctness
220.	~~withliquid~~ → with liquid	Misspelled Words	Correctness
221.	~~manufac- turing~~ → manufacturing	Confused Words	Correctness
222.	Manufacturing technology	Improper Formatting	Correctness
223.	~~technology of~~ → technology of	Improper Formatting	Correctness
224.	, Characterization	Improper Formatting	Correctness
225.	~~anaustenitic~~ → an austenitic, austenitic	Misspelled Words	Correctness
226.	, and	Comma Misuse within Clauses	Correctness
227.	*T.Wróbel,Characterization of bimetallic castings with anaustenitic working surface layer and an unalloyed cast steel base, Journal of Materials Engineering and Performance 23,1711-1717 (2014).*	Incomplete Sentences	Correctness
228.	~~Mahendiran~~ → Mahendra	Misspelled Words	Correctness
229.	~~aluminium~~ → aluminum	Mixed Dialects of English	Correctness
230.	commercial-grade	Misspelled Words	Correctness
231.	research ,	Improper Formatting	Correctness
232.	a supplement	Determiner Use (a/an/the/this,	Correctness

		etc.)	
233.	*Proceedings of the International Seminar on Metallurgy and Materials (ISMM2017) AIP*	Volume 1964: Proceedings of the International Seminar on ... https://printorders.aip.org/proceedings/1964	Originality
234.	*The aim of this paper is to describe*	D103 CRITICAL CARE: IMPROVING PALLIATIVE AND END OF LIFE CARE IN THE ICU: Icu Nurses Focus Group On Acceptabilitytesting Of Vidatalk(TM)	Originality
235.	*The aim of this study is to make*	The aim of this study is to make a reflection of how ... http://lang-8.com/766749/journals/10725856955572371730116939185566902 6549	Originality
236.	*Due to the absorption of heat by the*	Differential scanning calorimetry - Wikipedia https://en.wikipedia.org/wiki/Differential_scanning_calorimetry	Originality
237.	*Based on the obtained results it can be concluded that*	Studies on seasonal population dynamics of the citrus leaf miner, Phyllocnistis citrella stainton (lepidoptera: gracillariidae) on kinnow in submontaneous region of Punjab	Originality