

SUPPORTING INFORMATION

Tribochemical synergy between phosphate-intercalated layered double hydroxide additives and super high oleic safflower oil on sliding contacts †

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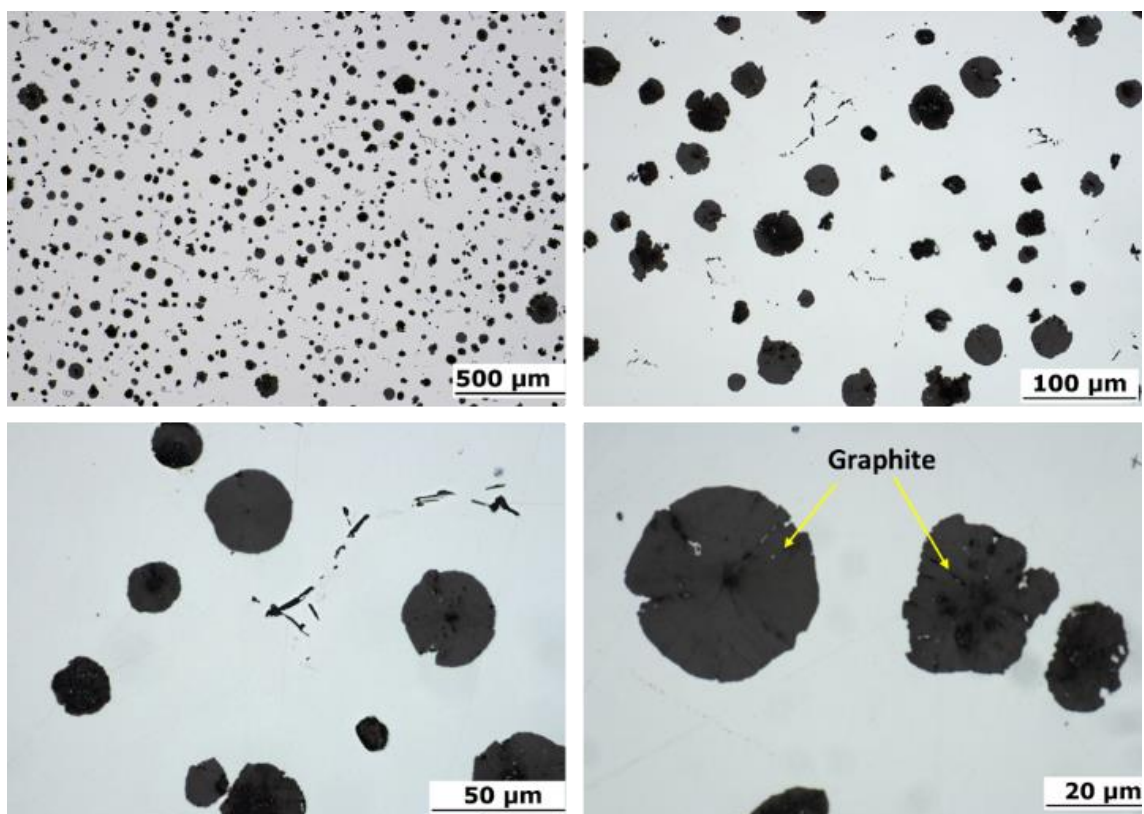


Fig. S1. Optical micrographs of polished cast iron.

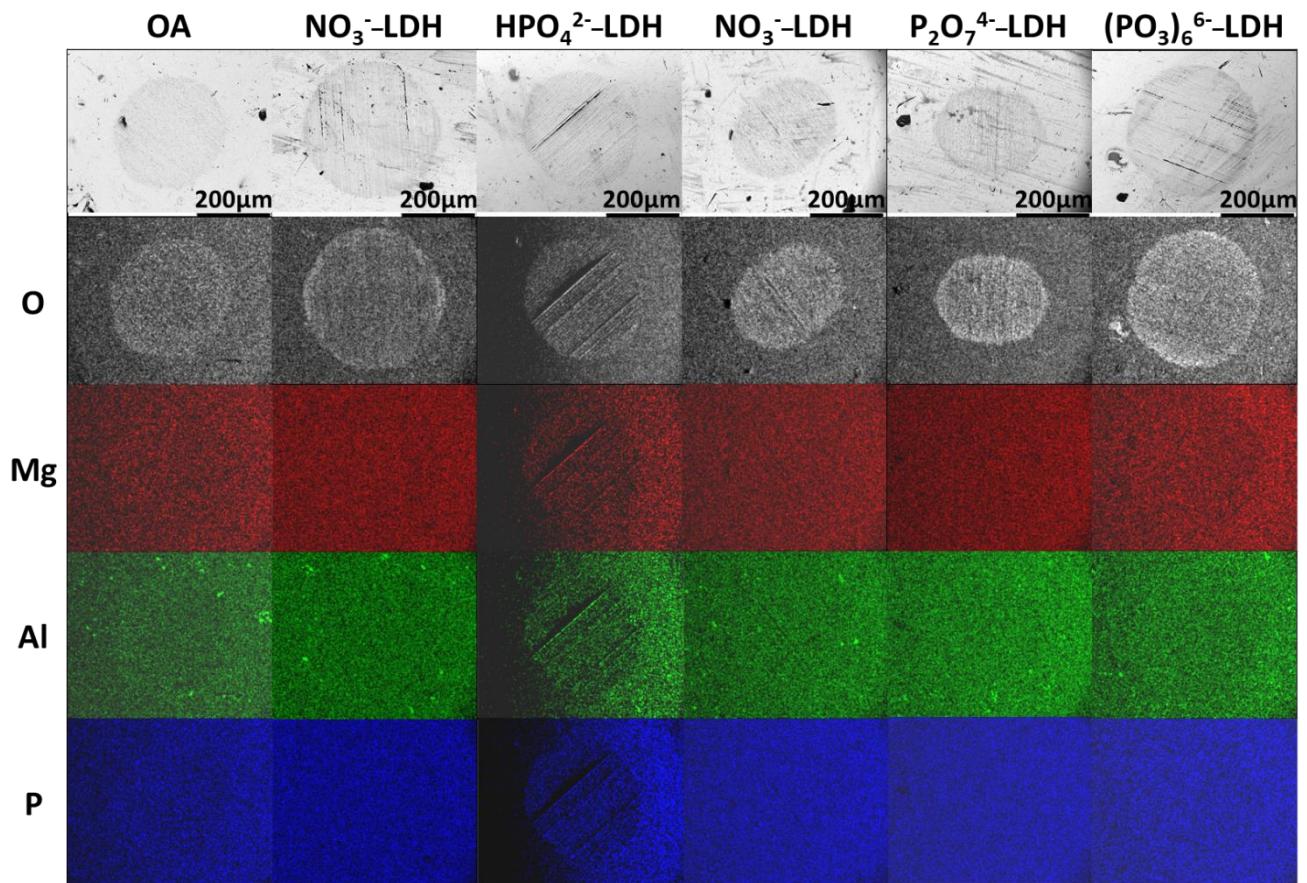


Fig. S2. SEM micrographs and elemental distribution on worn scars of and 0.5 wt% of different LDHs in OA.

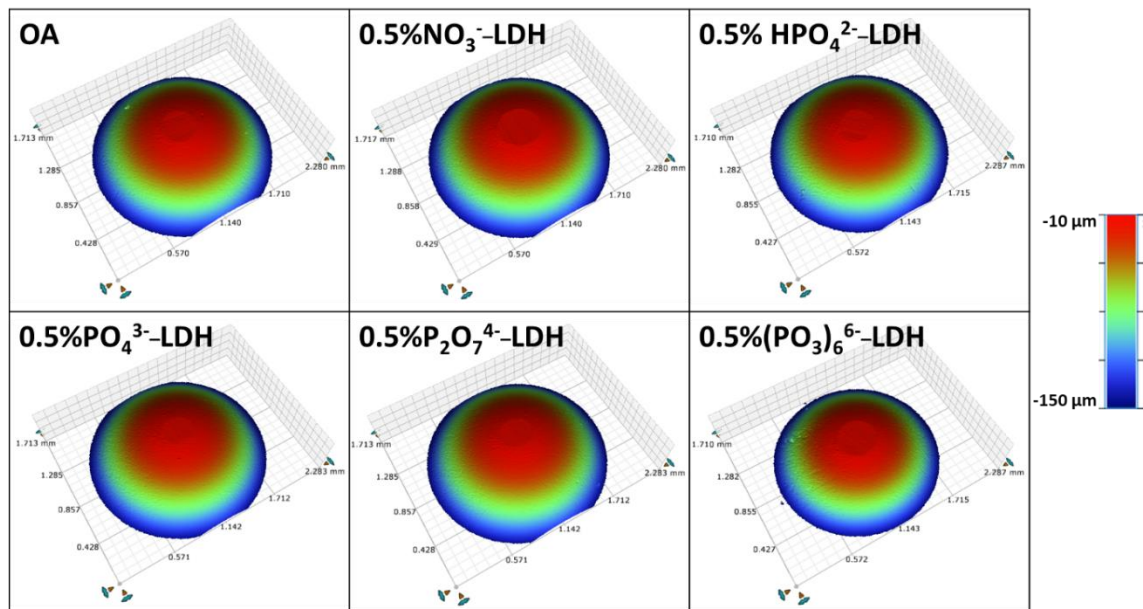


Fig. S3. 3D profile of wear scars of OA and 0.5 wt% of different LDHs in OA.

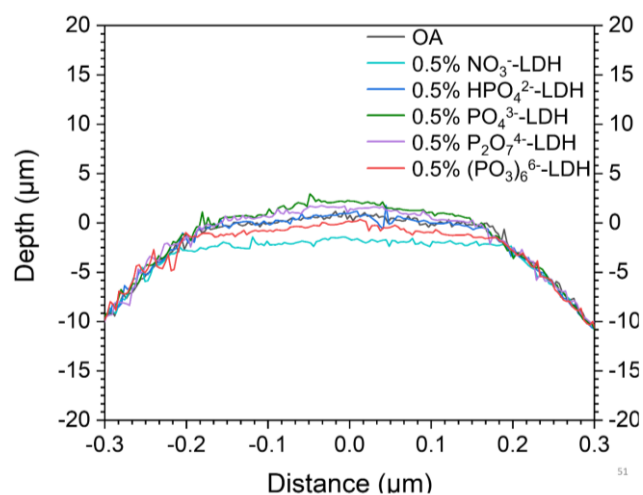


Fig. S4. 2D profile of wear scars of OA and 0.5 wt% of different LDHs in OA.

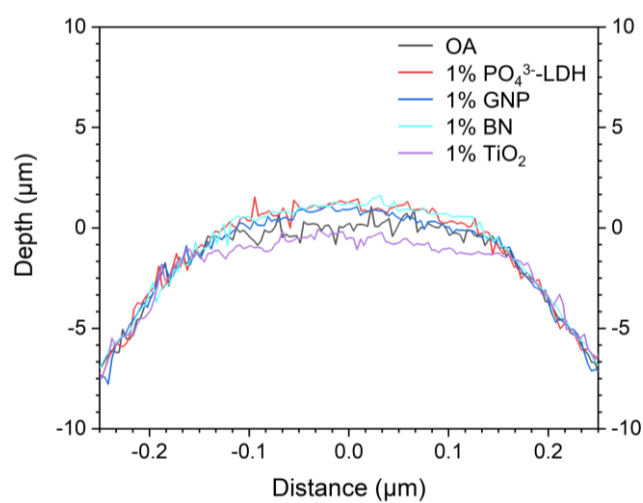


Fig. S5. 2D profile of wear scars of OA, 1 wt% PO₄³⁻-LDH, GNP, BN, and TiO₂ in OA samples.

Table S1. pH values of the suspensions and stirring time during anion exchange.

| Sample | HPO ₄ ²⁻ -LDH | PO ₄ ³⁻ -LDH | P ₂ O ₇ ⁴⁻ -LDH | (PO ₃) ₆ ⁶⁻ -LDH |
|-------------------------|-------------------------------------|------------------------------------|--|--|
| pH | 6.5 | 12.5 | 7 | 7.5 |
| Stirring duration (hrs) | 16 | 48 | 16 | 16 |

Table S2. Chemical composition (other than Fe) of GCr15 chrome steel and cast iron.

| Composition (%) | C | Si | Mn | Mg | P | S | Cr | Mo |
|-----------------|----------|-----------|---------|-----------|-------|-------|---------|-----|
| GCr15 steel | 0.95-1.1 | 0.15-0.35 | 0.5 | - | 0.025 | 0.025 | 1.3-1.6 | 0.8 |
| Cast iron | 3.25-3.7 | 2.4-3.0 | 0.1-0.4 | 0.04-0.07 | - | - | - | - |

Table S3. Concentrations of sodium phosphates salts.

| Sample | Average steady-state COF | COF reduction | Average wear volume loss (x10 ⁻³ mm ³) | Reduction of wear volume loss |
|--|--------------------------|---------------|---|-------------------------------|
| OA | 0.093 ± 0.001 | - | 0.150 | - |
| 0.62 wt% NaNO ₃ | 0.102 ± 0.003 | -10% | 0.411 | -175% |
| 0.5 wt% Na ₂ HPO ₄ | 0.098 ± 0.001 | -6% | 0.172 | -15% |
| 0.92 wt% Na ₃ PO ₄ | 0.097 ± 0.001 | -5% | 0.093 | 38% |
| 0.81 wt% Na ₄ P ₂ O ₇ | 0.099 ± 0.002 | -7% | 0.090 | 40% |
| 0.74 wt% (NaPO ₃) ₆ | 0.098 ± 0.003 | -6% | 0.173 | -16% |